CHNOLOGY DEPARTMENT

ROADS AND STREETS

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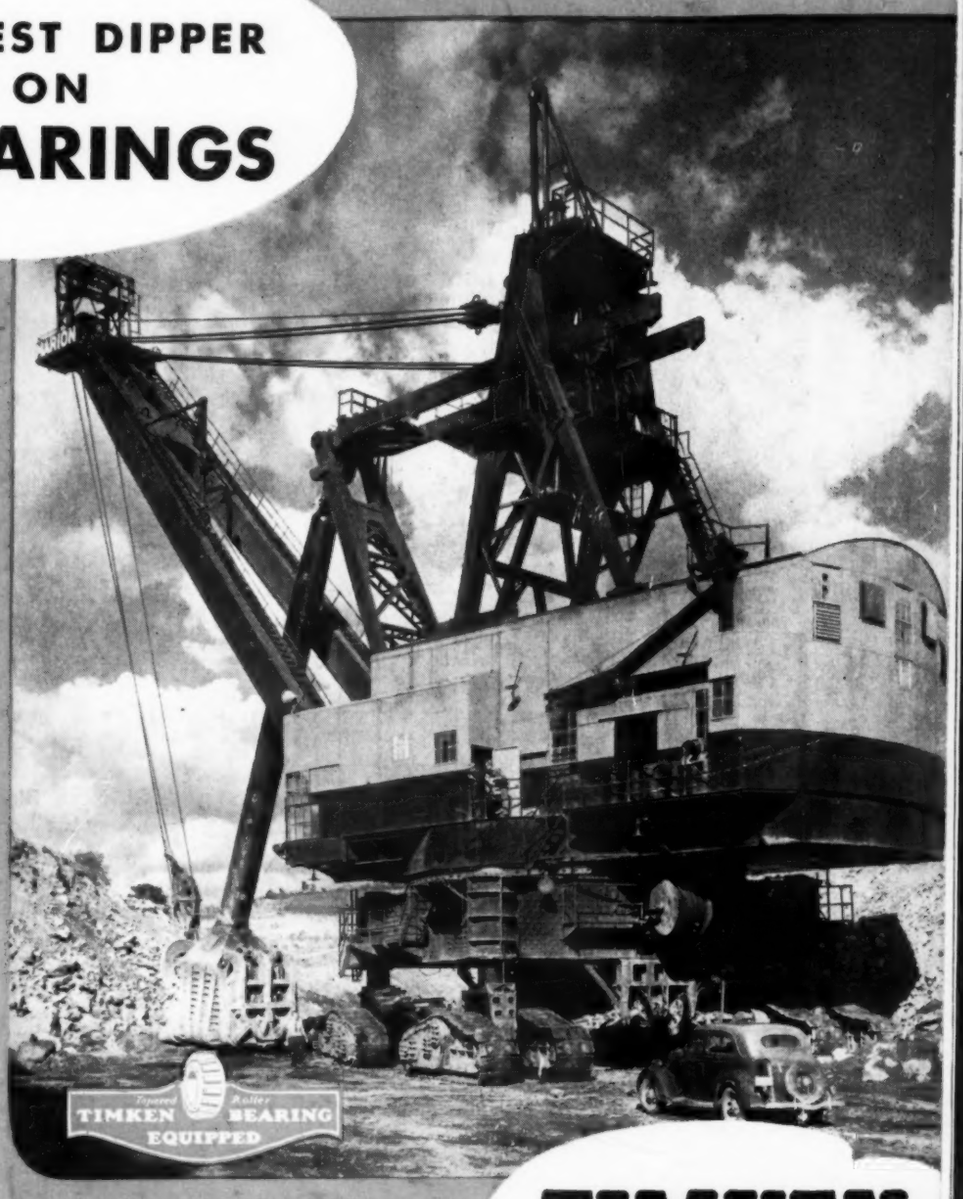
WORLD'S BIGGEST DIPPER CARRIED ON TIMKEN BEARINGS

ery time the dipper on this giant larion 5561 power shovel takes its 40 L yard bite of earth, the combined weights of the dipper and its contents (over 100 tons) are carried on the boom point sheaves. Every time this 100 ton load is raised or lowered, the boom point sheaves must rotate easily to prevent cable wear.

What kind of bearings can carry this tremendous load and operate freely, dependably? Timken Tapered Roller Bearings. Timken Bearings are made from the finest steel ever developed for tapered roller bearings — Timken Fine Alloy Steel. Due to the line contact between the tapered rolls and races, and the positive alignment of the rolls, Timken Bearings have tremendous radial, thrust and combined load capacity. And even under the heaviest loads their true rolling motion and incredibly smooth surface finish enable Timken Bearings to operate without friction.

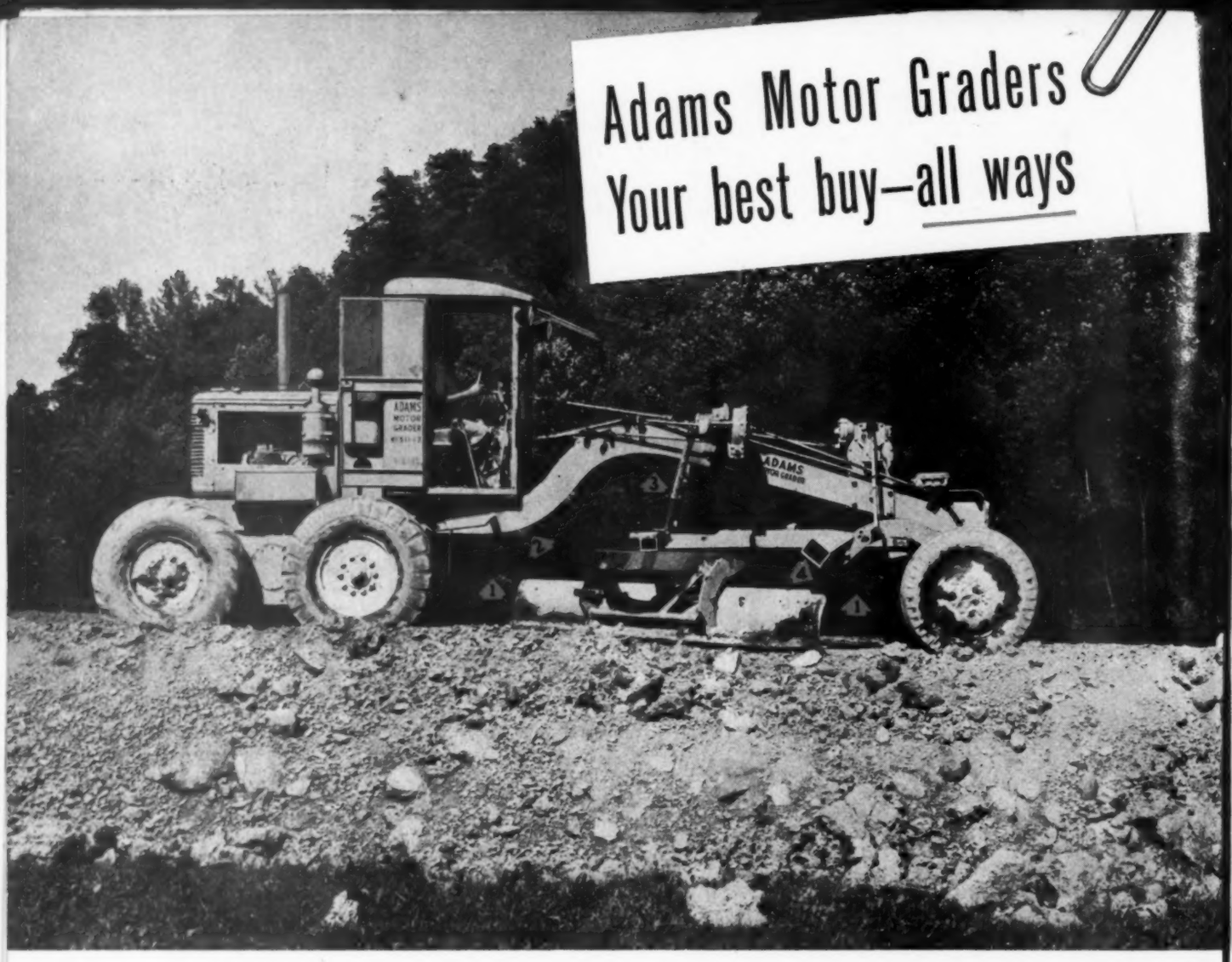
No other bearings can give your equipment *all* the advantages you get from Timken Bearings. Be sure they're used wherever wheels and shafts turn on the machinery you build or buy. Look for the trade-mark "TIMKEN" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio.



Marion Type 5561 Power Shovel equipped with Timken Bearings at the following positions:
- Rotating gear case
- Deflection sheave on gantry
- Dipper sheave block
- Boom point sheaves

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⬭ AND THRUST ⬭ LOADS OR ANY COMBINATION



Ample Blade Clearance

IN ALL OPERATING POSITIONS

● Experienced motor grader operators know that blade clearance—*plenty of it, in the right places*—is essential to fast, efficient blade positioning.

That's why Adams Motor Graders are designed and built with an abundance of blade clearance at all critical points:

1. **Between Blade Ends and Tires:** Lots of room provided for sharp blade angles—without tire interference, front or rear.
2. **Between Blade and Frame:** Space aplenty for free movement of the blade heel.
3. **Between Blade Assembly and Frame Arch:** More space for higher blade lift and better ground clearances.
4. **Between Blade and Scarifier Block:** Ample room for easy reversing of blade under scarifier block.

This is another example of how thoughtful engineering makes Adams Motor Graders *Your Best Buy—All Ways.* See your local Adams dealer for complete information and illustrated literature.

J. D. ADAMS MANUFACTURING CO. • INDIANAPOLIS, INDIANA

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MOTOR GRADERS • LEANING WHEEL GRADERS • ELEVATING GRADERS

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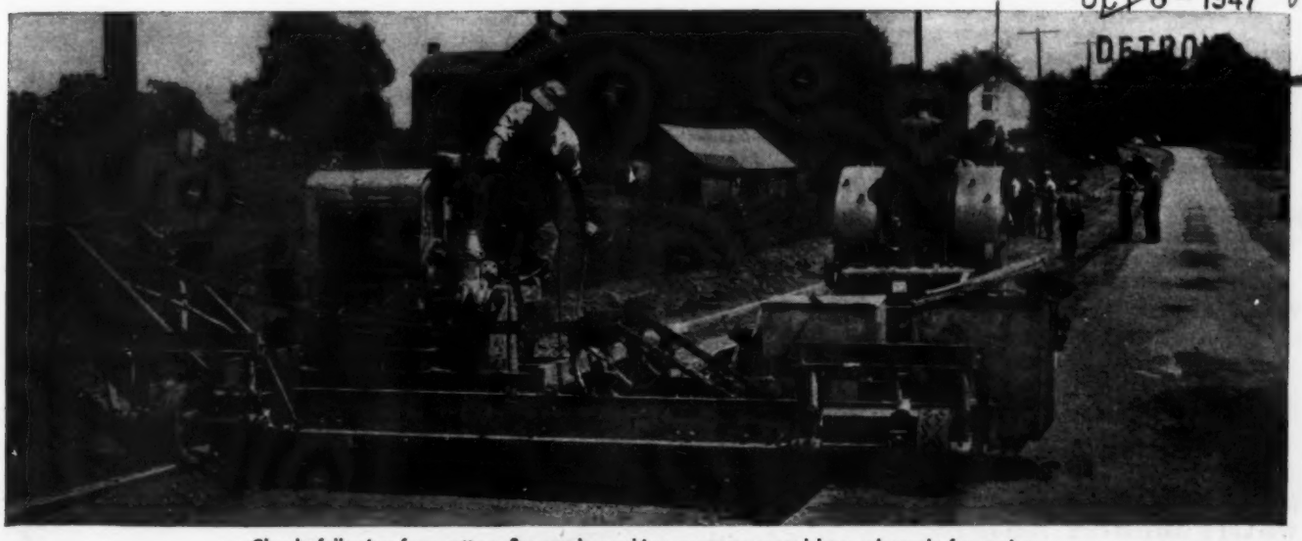

Closely following form setters, fine-grade machine prepares second lane sub-grade for paving.

Building New Roadway on Pennsylvania's Skippack Pike

Left to right: M. W. Sweeney, Senior Construction Inspector; J. C. Feltman, Mixer Foreman; Charles J. Wolf, Concrete Superintendent; E. F. Rodia, Asst. Construction Inspector; and W. J. Houck, Resident Engineer.

Bethlehem Hinged Bar Mat goes into place. Note that mat is being handled by only two men.

Seconds after steel is placed, paver drops batch over Bethlehem Hinged Bar Mats.

As transverse screed (foreground) trims off excess cement, longitudinal screed smooths concrete for hand-brushing.

Taken between Skippack and Bethel Hill, Pa., these photographs show construction on Route 73, commonly called the Skippack Pike, running northwest from the Tacony-Palmyra Bridge over the Delaware River. This stretch of the highway, more than two miles in length and replacing a section long in need of repair, is being built by John H. Swanger, Lancaster, Pa. Reinforcing bars, bar mats, road joints and guard rail were among the highway products furnished by Bethlehem.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation

STEEL FOR HIGHWAYS

Road Joints • Reinforcing Bars • Bar Mats • Guard Rail
Tie-Rods • Guard Rail Posts and Brackets • Spikes
Wire Rope and Strand • Hollow Drill Steel
Fabricated Structural Steel • Bolts and Nuts
Sheet and H-Piling • Timber Bridge Hardware

BETHLEHEM STEEL

ROADS AND STREETS

SEPTEMBER, 1947 • VOL. 90 • No. 9

With Roads and Streets Have Been Combined Good Roads Magazine And Engineering & Contracting

Articles Ahead

How D. W. Winkelman & Co. Worked a 200,000 C. Y. Borrow Pit
and other details of Mohawk Thruway project near Syracuse

Highway Officials Convention
The current New York City meeting of AASHO will be one of best attended and a wealth of significant data on many subjects will be covered. Look for a detailed report by the R and S editors

Underground Sampling by the Soil Tube Method
O. J. Porter, consulting engineer, describes California state highway practice and gives details of latest heavy-duty combination foundation drill rig—an all-purpose outfit which saves much time, labor on soil investigation

New Moisture-Density Field Test
A quick new means of checking compaction without waiting for a lab report, as described by a soils engineer on the Houston Expressway projects

New Horticultural Methods Needed
A national leader in roadside development and landscaping challenges engineers, contractors and manufacturers to develop better labor-saving equipment for mulching, seeding, sodding and maintaining our growing acreages of right-of-way

Bascule Bridge Repairs
and other project stories on phases of bridge design and construction

"Heavy" Highway Relocation
"Heavy" is the word for this grading job, north of Santa Monica. How Peter Kiewit & Sons Co. tackled this spectacular project

Other coming articles on: bridge erection, grading methods, estimating, pavement design, aggregate production, concrete hauling in non-agitating trucks

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

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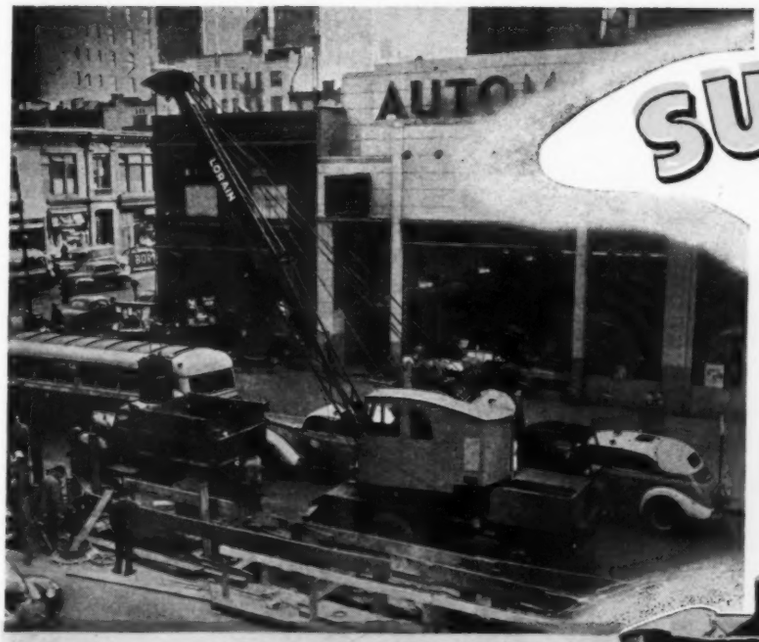
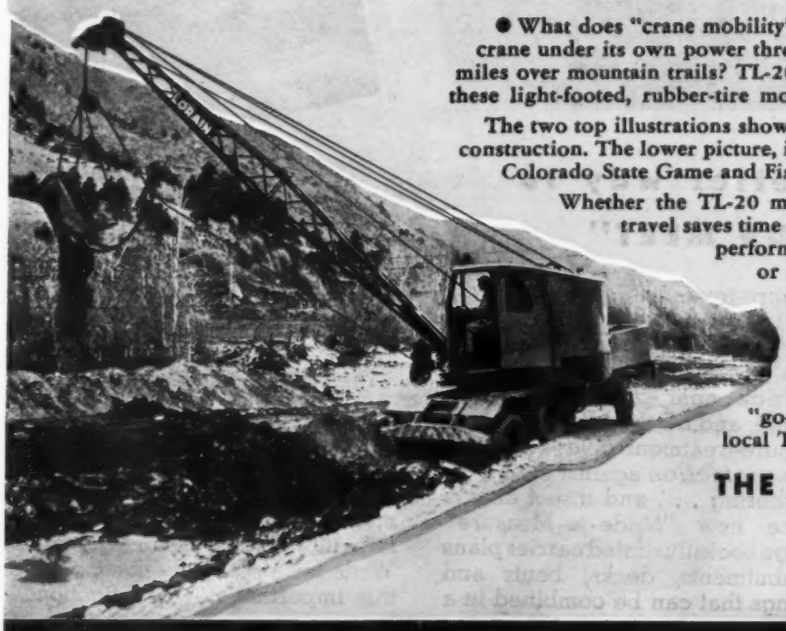


SUBWAYS...

to FISH PONDS

TL-20 Mobility pays off both in crowded city and wide open spaces



● What does "crane mobility" mean to you? The ability to "shoe horn" a crane under its own power through a crowded city street or to travel many miles over mountain trails? TL-20 owners are doing both to cover jobs with these light-footed, rubber-tire mounted units.

The two top illustrations show TL-20's at work on New York City subway construction. The lower picture, in direct contrast, shows a similar unit of the Colorado State Game and Fish Dept. digging a fish pond.

Whether the TL-20 moves blocks or miles in a day, rubber-tire travel saves time and money between jobs—and its on-the-job performance as a shovel, crane, clamshell, dragline or hoe will add to these savings through fast, efficient operation.

The TL-20 offers a choice of 9 rubber-tire mountings plus a score of outstanding shovel and crane construction features. For complete information on this proved "go-getter" in the ½ yd. class, write or call your local Thew-Lorain distributor.

THE THEW SHOVEL COMPANY
LORAIN, OHIO

Lorain® TL-20 Thew Lorain

Here's a new and better way to "MAKE BOTH ENDS MEET"

Now—a NEW Koppers service has been combined with an established Koppers product, to help you conserve engineering TIME in your highway department, and bridge DOLLARS in your highway budget.

By applying the modern principle of using *standardized* parts to build *"Made-to-Measure"* timber trestle bridges, Koppers helps you to eliminate much of the costly, time-consuming design, detailing, and bill-of-material preparation that are ordinarily required in bridge projects.

By pre-fabricating all members, Koppers helps you to *speed-up construction;* only assembly is required at the job site. Erection can be handled with no special equipment, using regular highway crews plus local labor.

This new Koppers service makes it easier than ever before to utilize pressure-treated timber-trestle bridges—with their *proven economies* of low first-cost, low maintenance cost, adaptability to change, and LONG LIFE. Koppers pressure-treatment gives *dependable protection* against decay . . . weathering . . . and insect attack.

The new "Made-to-Measure" bridge book illustrated carries plans of abutments, decks, bents and railings that can be combined in a number of ways, to solve practically all problems ordinarily encountered. Data sheets, furnished with the book, provide an easy means of submitting necessary information to Koppers for a quotation. Write for a complimentary copy of this important new publication.

K
KOPPERS

PRESSURE-TREATED WOOD

KOPPERS COMPANY, INC:
PITTSBURGH 19, PENNSYLVANIA

if there is a NORTHWEST in the picture

it's on the toughest part of the job!

Take any job you want to and if there is a Northwest on it you can bet it's on the rock end of the digging.

The Northwest Shovel is built for the toughest job a shovel has to do. It's big—powerful with a welded boom that has been proved under punishment.

Dipper sticks are tied together at the upper end with a cap casting that assures their working as a unit. The Dual Independent Crowd utilizes force that other shovels waste. The "Feather-Touch" Clutch Control gives the *feel of the load* and makes handling the big ones easy, and the Cushion Clutch eliminates the effects of shock overload to parts under power when the dipper hits immovable rock.

Here is a combination you won't find in any other shovel. Follow the Northwest Crowd and have a real Rock Shovel.

NORTHWEST ENGINEERING CO.
1504 Field Bldg., 135 South LaSalle St., Chicago 3, Ill.

Follow the NORTHWEST CROWD

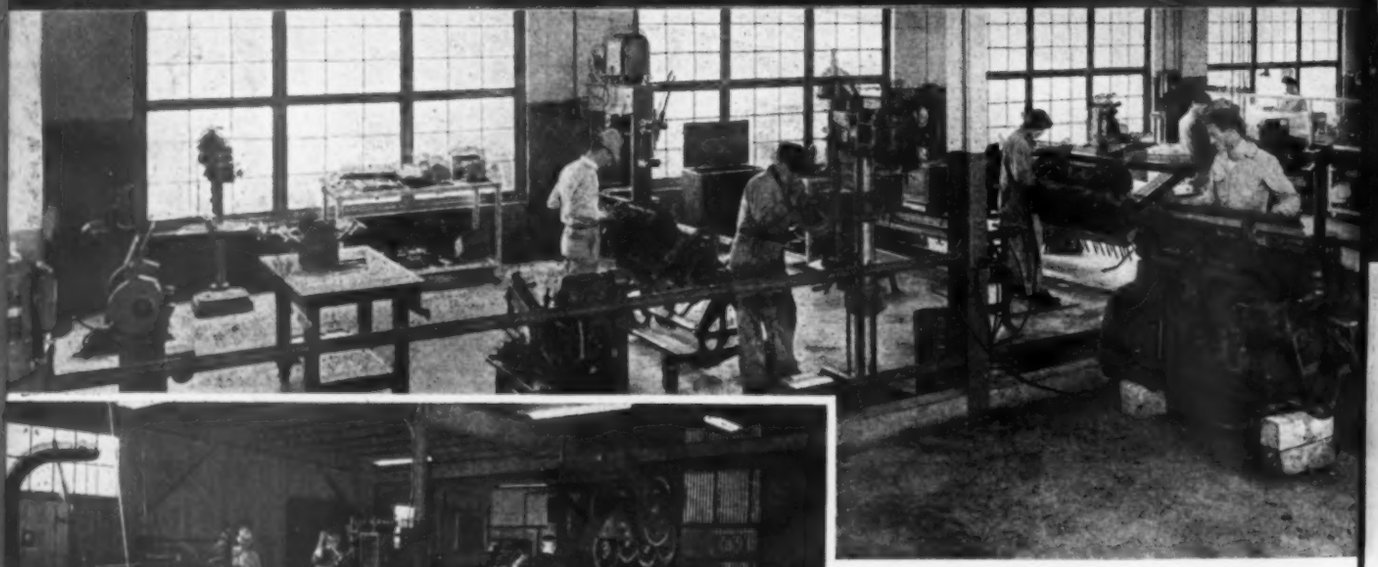
Still the Standard around which other loaders are built

If you have a REAL ROCK SHOVEL you won't have to worry about output in dirt

NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

International distributors maintain complete stocks of parts under a perpetual inventory control. This, plus nearby International parts depots, assures prompt supply of any needed part.



Factory-trained mechanics, using modern fixtures and tools, make sure of factory-level servicing, repairing and rebuilding of International engines. The engine department of a distributor's shop is shown above.

Shears, drills, lathes, punch presses and other powered tools are used in many distributors' shops for equipment repair or construction.

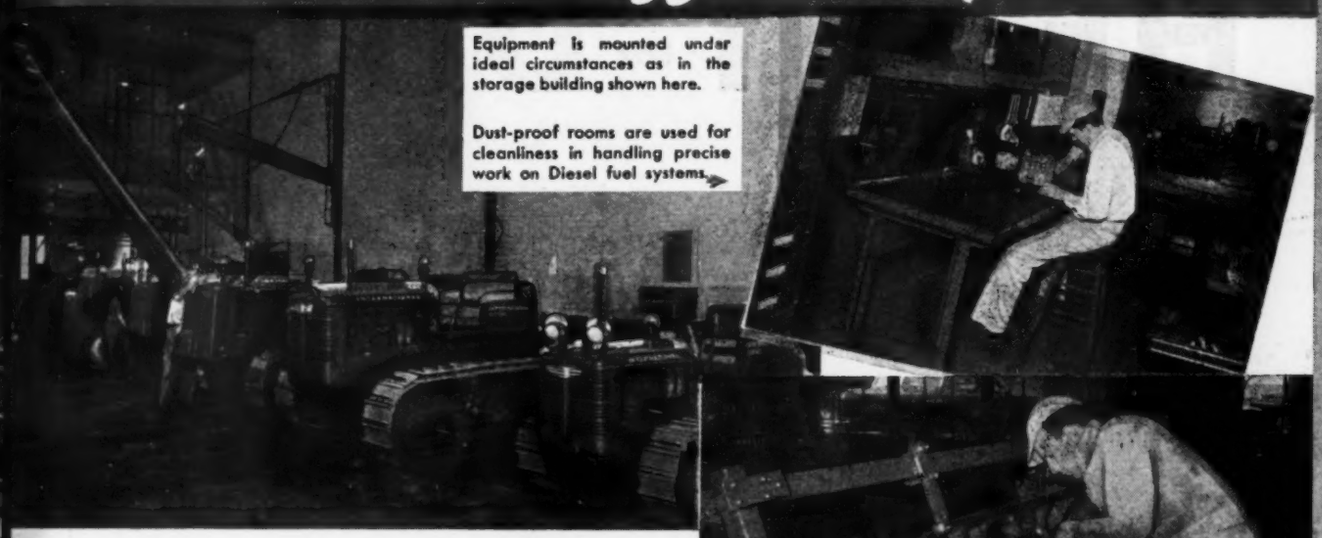
CRAWLER TRACTORS
POWER UNITS
DIESEL ENGINES
WHEEL TRACTORS

INTERNATIONAL

Unexcelled

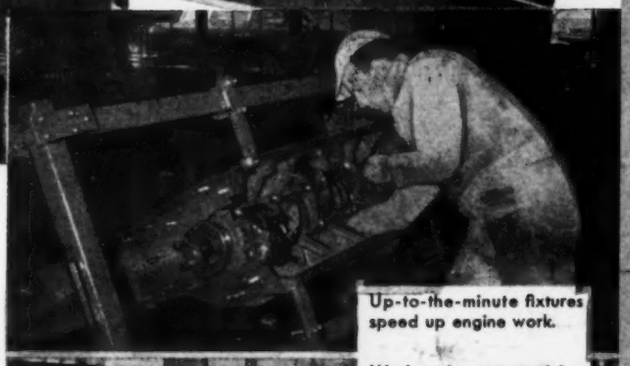
NATION-WIDE SERVICE
and Parts Facilities

Keep INTERNATIONAL Power *at Peak Efficiency*



Equipment is mounted under ideal circumstances as in the storage building shown here.

Dust-proof rooms are used for cleanliness in handling precise work on Diesel fuel systems.



Up-to-the-minute fixtures speed up engine work.

Wash racks near receiving docks promote cleanliness.

INTERNATIONAL Industrial Power Distributors throughout the nation are superbly equipped to service and maintain International tractors and International-powered equipment.

Keeping "down time" to a minimum is the function of this nation-wide parts and service network—so that Internationals may produce better profits for their owners through greater dependability and longer operating life.

Depend on your International Industrial Distributor for your equipment and service requirements.

Industrial Power Division
INTERNATIONAL HARVESTER CO.
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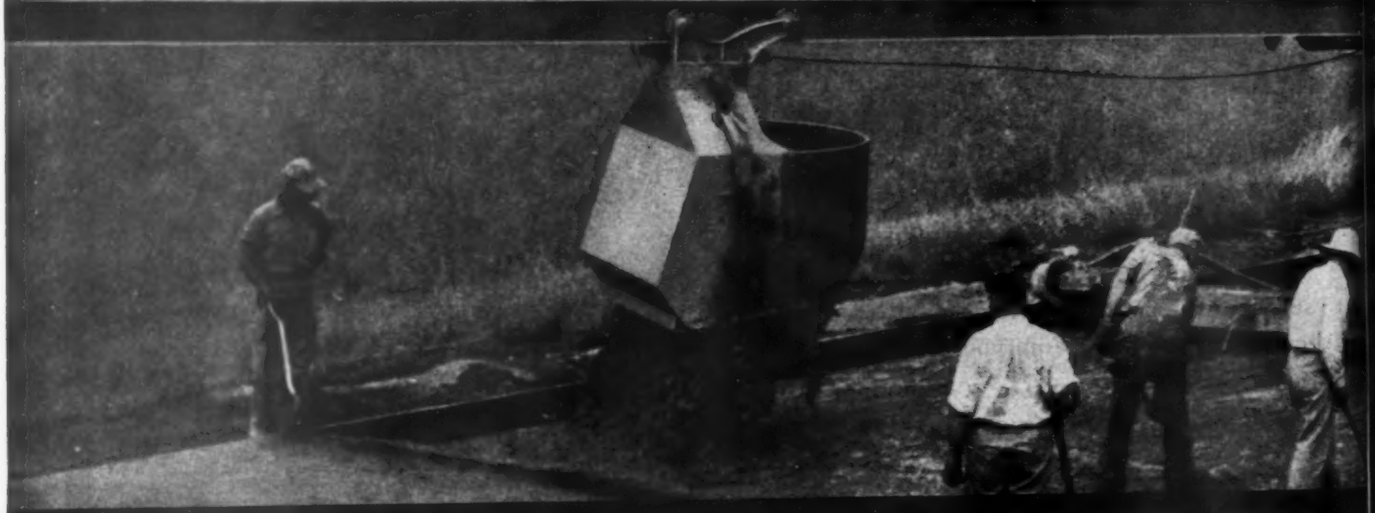
INTERNATIONAL HARVESTER

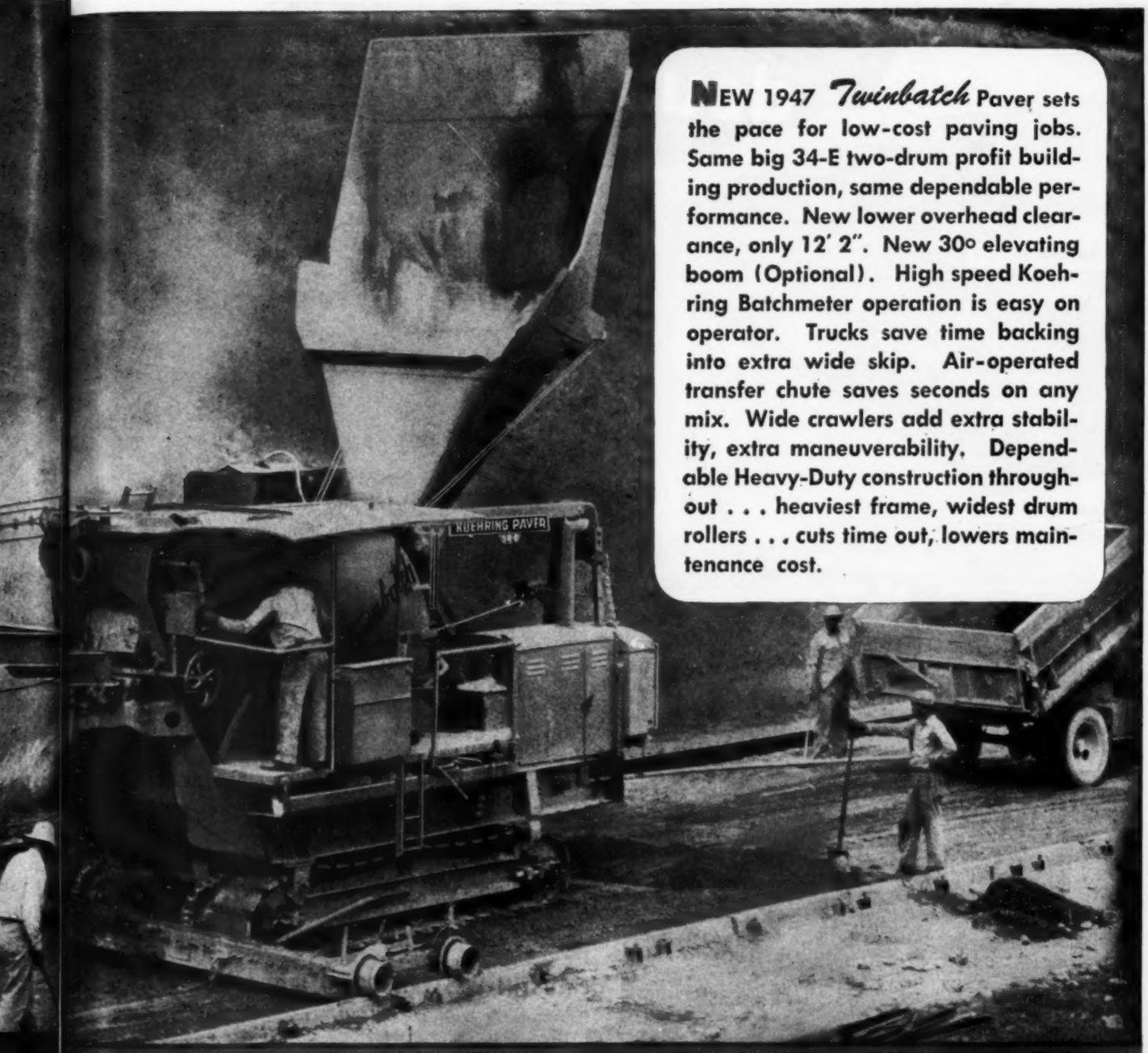
Industrial Power

All the way, it's
KOEHRING
HEAVY-DUTY

for steady output, speed and economy



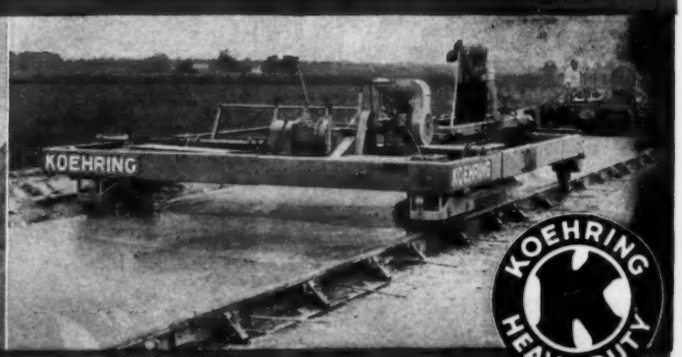
GRADING TO FINISHING, IT'S KOEHRING FOR LOW COST



NEW 1947 *Twinbatch* Paver sets the pace for low-cost paving jobs. Same big 34-E two-drum profit building production, same dependable performance. New lower overhead clearance, only 12' 2". New 30° elevating boom (Optional). High speed Koehring Batchmeter operation is easy on operator. Trucks save time backing into extra wide skip. Air-operated transfer chute saves seconds on any mix. Wide crawlers add extra stability, extra maneuverability. Dependable Heavy-Duty construction throughout . . . heaviest frame, widest drum rollers . . . cuts time out, lowers maintenance cost.

With 2-yard clamshell bucket, this Koehring 605 keeps batch plant humming. Power clutch eliminates operator

Slab contours are always finished to exact specifications with a Koehring Longitudinal Finisher on slab. A Koehring



KOEHRING HEAVY DUTY

KOEHRING COMPANY Milwaukee 10, Wisconsin

Subsidiaries

doubly effective

Thanks to All-Wheel Drive and All-Wheel Steer

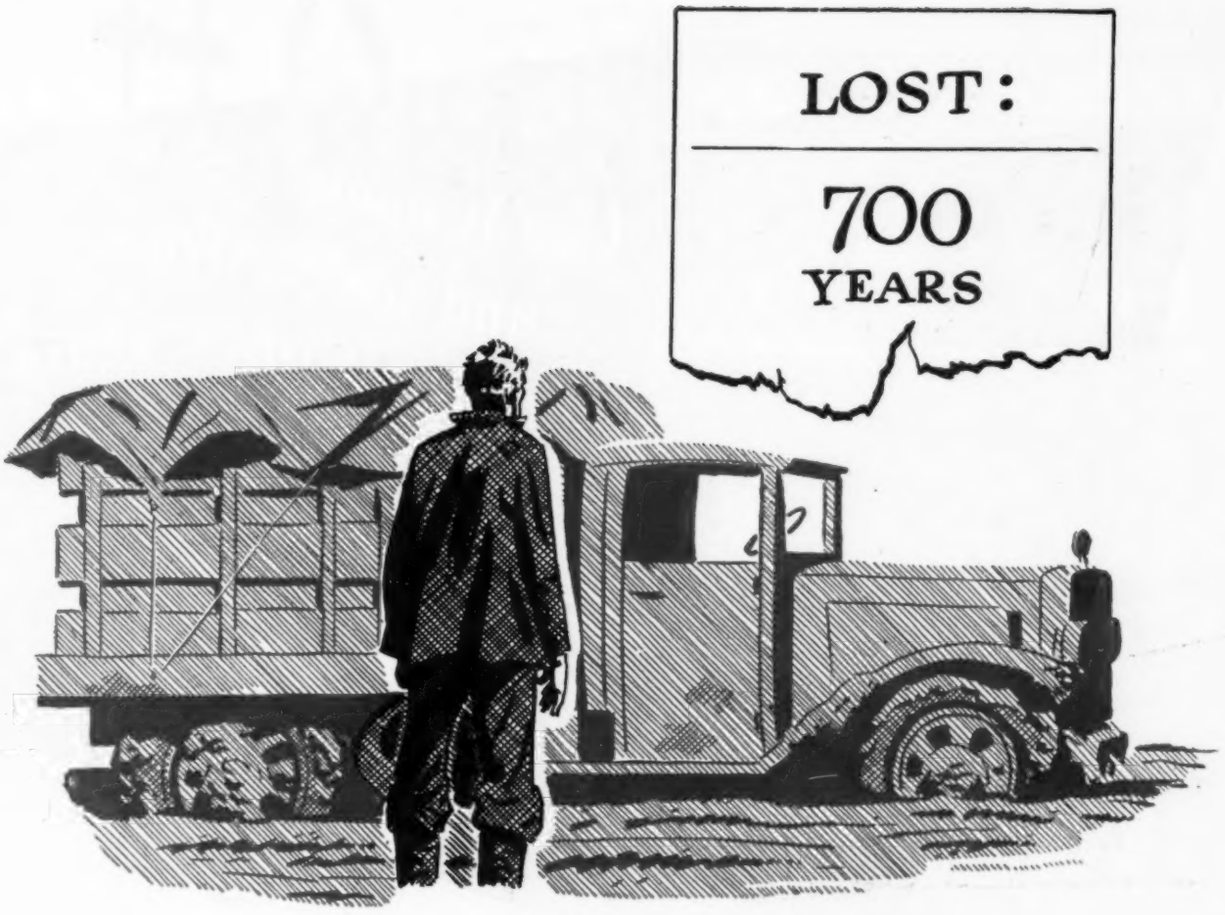
All-Wheel Drive and All-Wheel Steer make it possible to mount an attachment ahead of or behind the "99-H" Power Grader without sacrifice of operating efficiency or machine control. When the entire weight of the rear end of the machine is transferred to the Roller, the "99-H" drives and steers with its front wheels. When the entire weight of the front end is transferred to the Bulldozer, the "99-H" drives and steers with its rear wheels. An ordinary motor grader would be helpless under such conditions. In addition to making it possible to use attachments that could not be mounted on ordinary motor graders, All-Wheel Drive and All-Wheel Steer provide traction and maneuverability that make every attachment — front, center or rear mounted — just that much more effective than it would be on other motor graders.

AUSTIN-WESTERN CO., AURORA, ILL., U. S. A.

BUILDERS OF ROAD MACHINERY

Austin Western

SINCE 1859



If each of the 6,000,000 farmers in the land lost but one hour out of the year, mired on an unsurfaced farm-to-market road, those hours would add up to almost 700 years. That's a conservative estimate, too . . . for other things are lost besides time: money in repair bills . . . and injury in accidents.

These secondary roads can be surfaced economically—with Koppers Tarmac. Tarmac is an efficient and durable binder, that provides a skid-resistant, smooth-riding surface. It can be used for almost any type of construction, and needs virtually no maintenance. Local aggregate can be used with Tarmac, without need of additives to prevent stripping. Highly skilled labor is unnecessary.

Be sure your highway plans include Koppers Tarmac.

KOPPERS COMPANY, INC., Pittsburgh 19, Pa.

Write for the booklet "SURFACING WITH TARMAC" *which describes construction steps.*

Tarmac

K KOPPERS

makes good roads

1 *Original ARMCO Multi Plate installation—13¼ feet in diameter and 75 feet long.*

2 *This is what happened when a sudden flood washed out the road. The ARMCO Multi Plate structure was intact but was replaced by a bridge with greater flood capacity.*

3 *Making little bridges out of a big bridge was easy with ARMCO Multi Plate. Sections from the original structure were used in building this one. The same mitering was used at the ends without recutting. Two other arches, 7 feet in span and 40 feet long, were also constructed and enough plates were left for still another small bridge when needed.*

Multi Plate can be salvaged 100%

There's a song in every budget when you can offset disaster as easily as this experience shows.

When an unprecedented flood washed out a Multi Plate bridge it was replaced by a larger structure. Yet material loss was zero since the sturdy Multi Plate sections were salvaged and used to build several smaller bridges at other locations.

"Packaged" Multi Plate structures are "budget-savers" from start to finish. The easily-handled, pre-curved, corrugated plates are nested together to save space in shipping, hauling and storing. Construction is done with unskilled labor, the simplest equipment and small tools. No curing, no waste, no delay. The road is quickly opened to traffic—often without detours.

For a durable, economical job include Armco Multi Plate in your plans for bridges, stream enclosures, large sewers and special drainage structures. Then you'll never have to worry about being left "high and dry" should conditions change. Write today for complete data. Armco Drainage & Metal Products, Inc., 1385 Curtis Street, Middletown, Ohio

MULTI ARMCO PLATE

ARMCO Multi Plate

For a More Profitable Future...

PLAN AHEAD WITH ALLIS-CHALMERS

Watch Allis-Chalmers for the latest in construction equipment. Plans made years ago are now taking shape.

SOME OF THE NEW DEVELOPMENTS AND NEW EQUIPMENT YOU HAVE SEEN OR HEARD ABOUT IN THE LAST YEAR OR TWO:

..the revolutionary principle of a hydraulic torque converter drive in a tractor . . . that gets more work done, protects tractor and auxiliary equipment from destructive shock loads, makes it easier for operator.

. . the lengthening of greasing intervals and reduction in amount of lubricant required. Truck wheels, support rollers and idlers need attention only once in 1,000 hours!

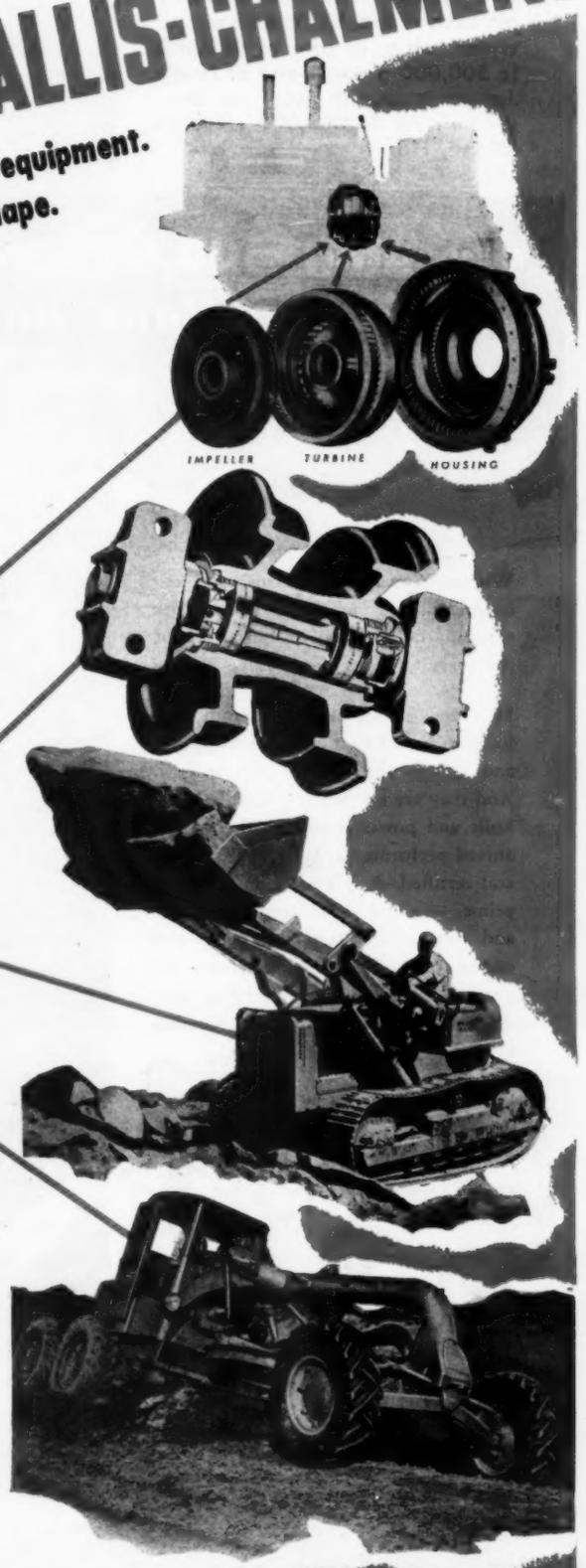
. . the introduction of the completely new HD-5 tractor, a new small tractor with big tractor balance, design and stamina . . . and for it, fully matched Allied equipment.

. . the further development of the Model A-D Motor Grader that led the way in more accurate, easier control, lower maintenance and greater earth-moving capacity.

• • •

Yet, this is only the beginning! Allis-Chalmers has set its sights high. To keep ahead of costs, keep up with A-C developments. Keep in touch with your Allis-Chalmers dealer.

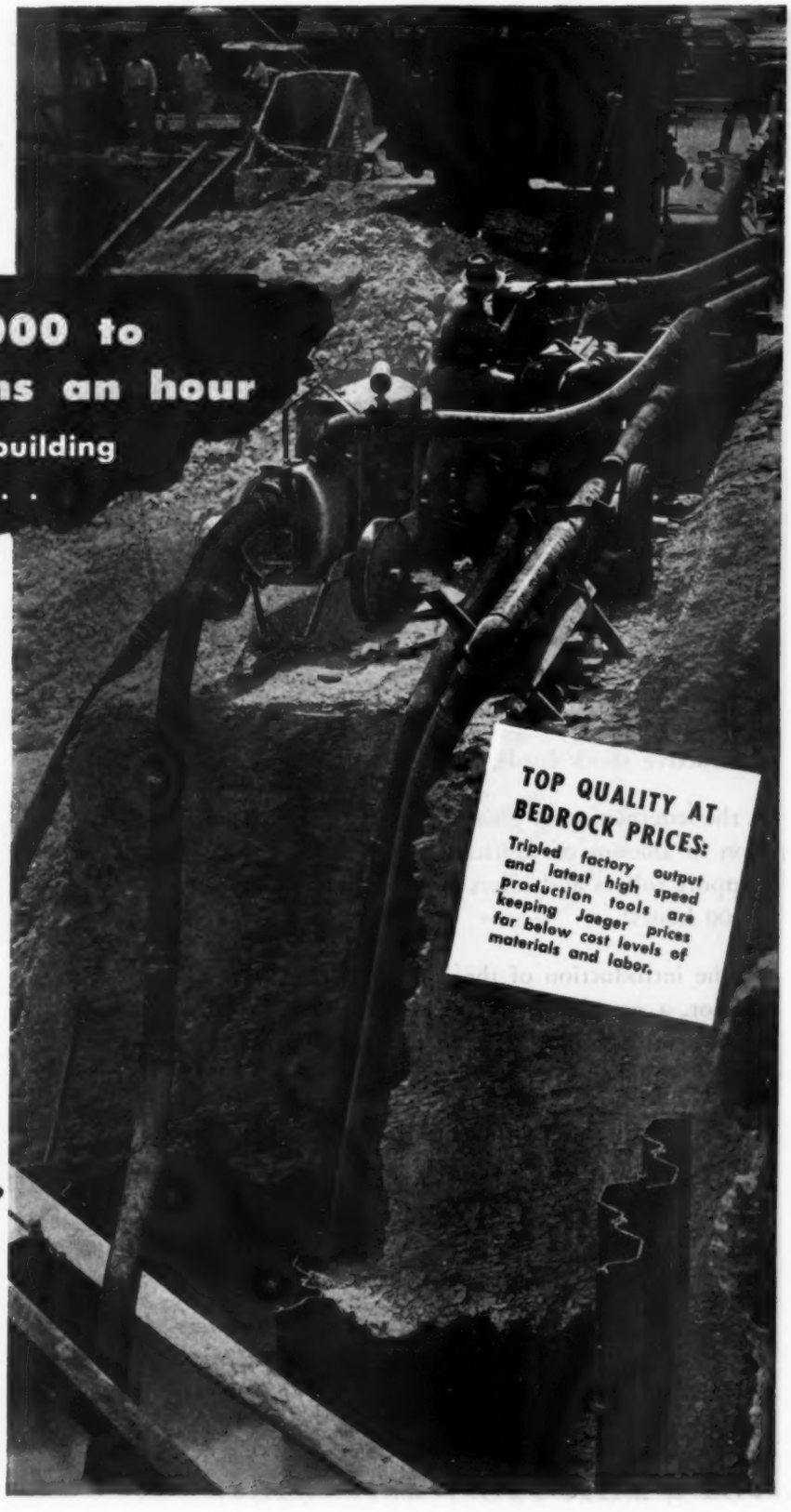
FOR A MORE PROFITABLE FUTURE . . . PLAN AHEAD WITH ALLIS-CHALMERS



ALLIS-CHALMERS Originator of the Torque Converter Tractor

TRACTOR DIVISION — MILWAUKEE 1, U. S. A.

Battery of 4 Jaegers worked 24 hours a day to dewater elevator pit excavation 12 ft. below low water table, at rate of 400,000 to 500,000 g.p.h.—one of many Jaeger pumping jobs on Burdine's new $1,000,000 store at Miami, Fla.



pumping 400,000 to 500,000 gallons an hour

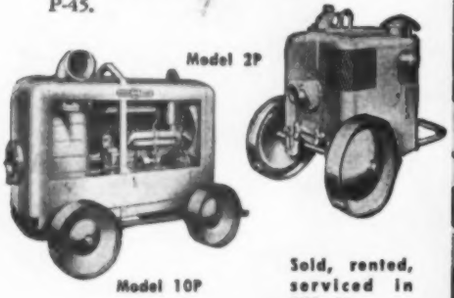
when a million dollar building can't wait on water . . .

Whenever water problems are encountered, on jobs that can't risk waiting, there's usually a hurry-call for the nearest Jaeger distributor.

He's the leading pump dealer in your locality. He keeps a big stock of pumps and fittings ready—for sale or rent. And they are all Jaeger "Sure Primes," built and powered beyond their guaranteed performance, individually tested and certified, doubly sure and faster to prime, and fully enclosed from dirt and weather to keep both pump and engine operating at top efficiency for years of extra-satisfactory service. Sizes 1½" to 10". Ask for complete Catalog P-45.

TOP QUALITY AT BEDROCK PRICES:

Tripled factory output and latest high speed production tools are keeping Jaeger prices far below cost levels of materials and labor.



Sold, rented, serviced in 128 cities.

THE JAEGER MACHINE CO.
Main Office, Factory: Columbus, Ohio

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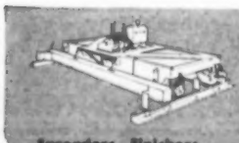

Spreaders, Finishers

Concrete Mixers

Compressors

JAEGER *Engineered* **EQUIPMENT**

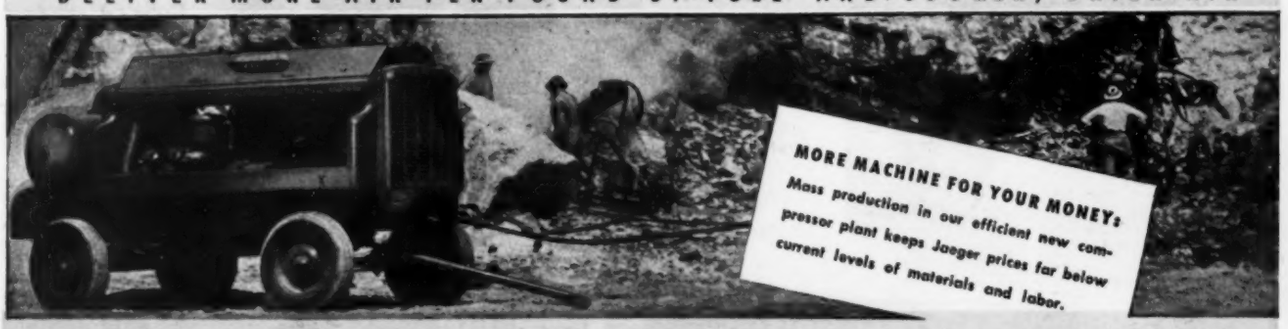
Truck Mixers • Hoists • Concrete and Bituminous Paving Equipment

AIR PLUS JAEGER COMPRESSOR

BUILT TO MICRO-PRECISION + 75%-100% LARGER "ULTRA LAPPED" VALVES

FORCE-FEED LUBRICATION + SLOWER, COOLER PISTON SPEED (800 F.P.M.)

DELIVER MORE AIR PER POUND OF FUEL AND COOLER, DRIER AIR



MORE MACHINE FOR YOUR MONEY: Mass production in our efficient new compressor plant keeps Jaeger prices far below current levels of materials and labor.

(WITHIN 100° OF ATMOSPHERE) WITH NOTABLY LOW UPKEEP

The keenest buyers, the biggest users are buying Jaeger "AIR PLUS" Compressors for LOW COST air. Sizes 60 to 600 cu. ft. Service in nearly 130 cities. See your Jaeger distributor.

THE JAEGER MACHINE COMPANY, Columbus 16, Ohio

REGIONAL OFFICES: 8 E. 48th St. NEW YORK 17, N. Y. — 226 N. LaSalle St. CHICAGO 1, ILL. — 235-38 Martin Bldg. BIRMINGHAM 1, ALA.

JAEGER Spreaders, Finishers

"SPEEDLINE" Concrete Mixers

"SURE PRIME" Contractors Pumps

JAEGER *Engineered* EQUIPMENT

"DUAL-MIX" TRUCK MIXERS, AGITATORS — HOISTING ENGINES, SELF-RAISING TOWERS — CONCRETE AND BITUMINOUS PAVING EQUIPMENT

For Money In Your Pocket
PERFORMANCE . . .

Resists Kinking

Being free from internal stress, it is always easy to handle—never fights back.

Spools Better

Even with a light load, it spools uniformly—is never cranky.

Takes Reverse Bends

Takes this "fatigue" much better, as on rope-ruining elevator installations.

Safer to Handle

Worn union-formed ropes handle as safely as new, as broken outer wires lie close to rope.

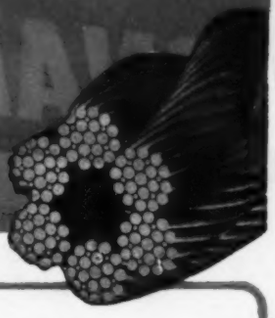
Always Relaxed

While it is flexible, and pliant, it has the "toughness" to withstand strain and weight.

Behaves on Grooves

Resists rotating or twisting in sheave grooves because wires are *Pre*formed.

. . . Specify



union-formed

(preformed)

THE ULTIMATE IN LOW COST WIRE ROPE

Precision Constructed to OUTPERFORM *ordinary Wire Rope*

FIGHT! FIGHT! There is an exhausting fight going on all the time in ordinary wire rope, Each wire is fighting constantly to get out of the fixed position into which it is forced without any preliminary training to put it in shape. This internal fighting spoils the performance, cuts it short, doesn't give you a run for your money.

In **union-formed** Wire Rope each wire is put in shape (*Pre*formed) before it ever touches another wire in the rope. The result is exactly the same that comes from a set of conditioned muscles, i. e. finer coordination, greater endurance, top-flight kind of performance that does not let you feel out-of-pocket.

Yes sir! You will always get the most out of the best. The little extra you invest for the best is the part of your investment which will bring the payoff—yield the most dividends. Prove this fact to your own satisfaction. *Specify* **union-formed** — get money-in-your-pocket performance.

union Wire Rope

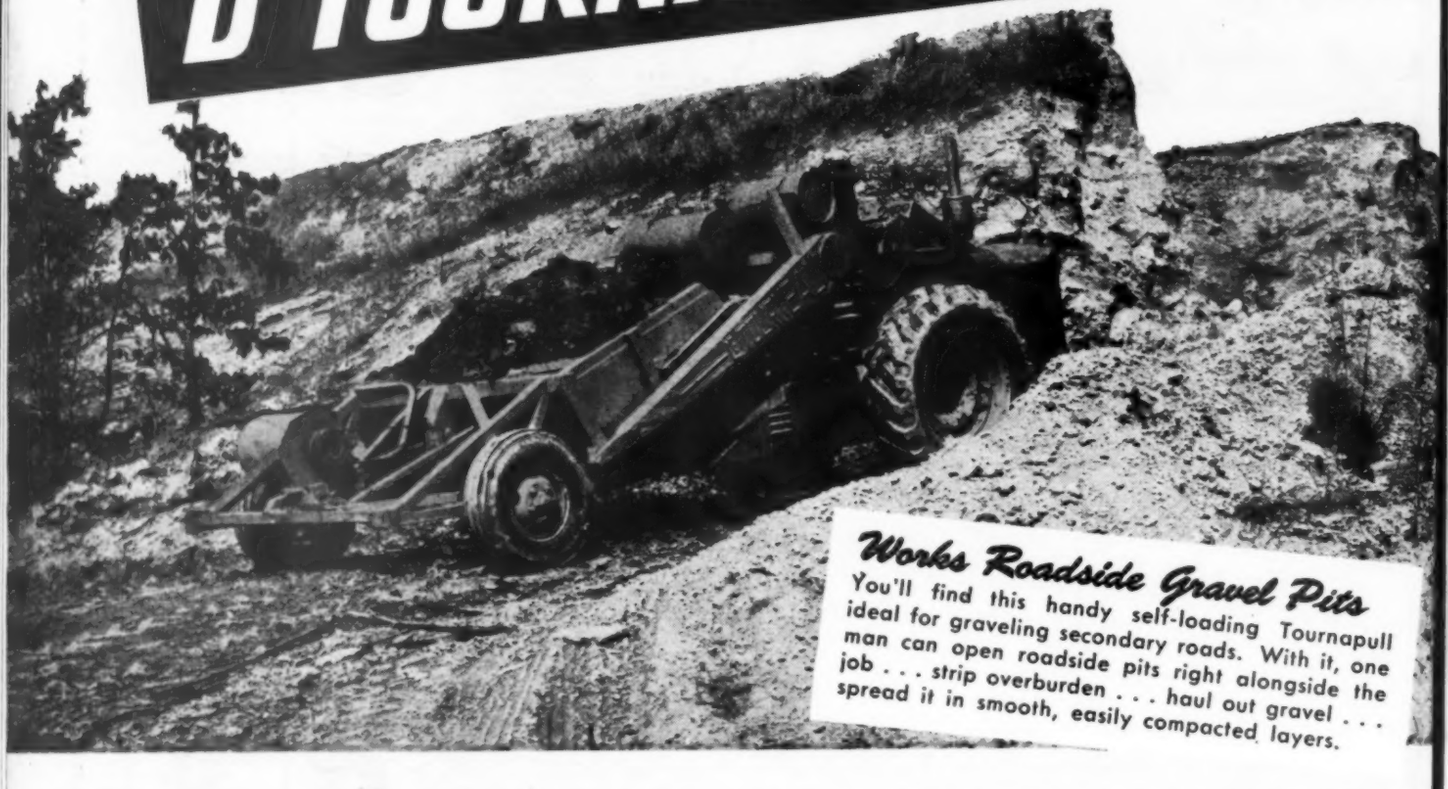
UNION WIRE ROPE CORPORATION

2200 Manchester Avenue Kansas City 3, Missouri

Tulsa 3 Houston 11 Chicago 6 Salt Lake City 13 New Orleans 16

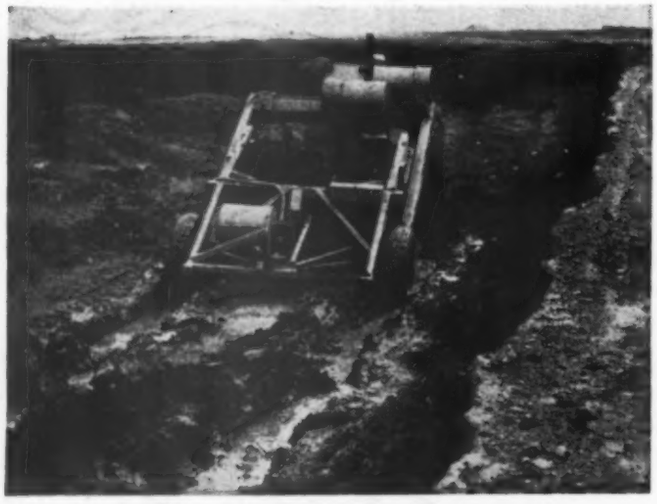
Monahans, Tex. Portland 10, Ore. Ashland, Ky. Atlanta 1

NEW HIGH-SPEED D TOURNAPULL gets at



Works Roadside Gravel Pits

You'll find this handy self-loading Tournapull ideal for graveling secondary roads. With it, one man can open roadside pits right alongside the job . . . strip overburden . . . haul out gravel . . . spread it in smooth, easily compacted layers.



Makes Quick Repairs Anywhere

Removes slides . . . fills mudholes and washouts . . . enables you to handle those "trouble-shooting" jobs promptly, with one man. It's a money-saver on small jobs where it costs more to move high-production equipment in and out than it does to move the dirt.

Handles Routine Maintenance

This small, fast "D" Tournapull is made to order for all kinds of light grading, cleaning drainage ditches, dressing shoulders, sloping banks and for road surfacing. Gets there fast . . . loads itself without a pusher . . . turns around on any road or ditch line without getting stuck.

Tournapull—Trademark Reg. U.S. Pat. Off. CS110

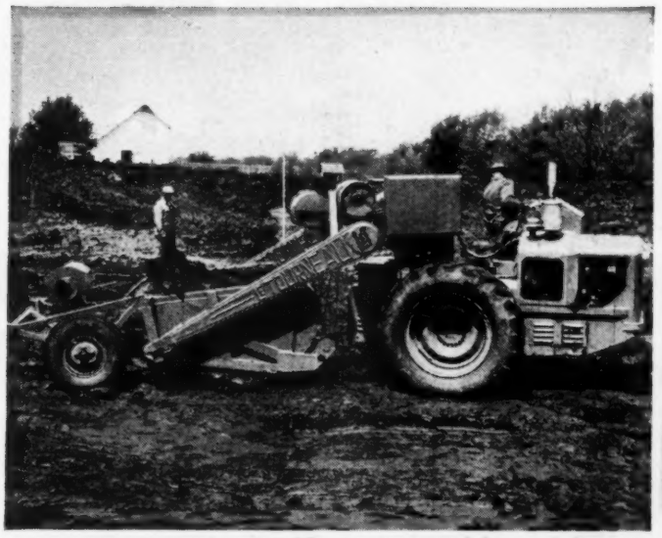
LETOURNEAU LET EQUIPMENT

See your Le Tourneau Distributor NOW for complete information

MORE JOBS DONE LESS COST PER JOB

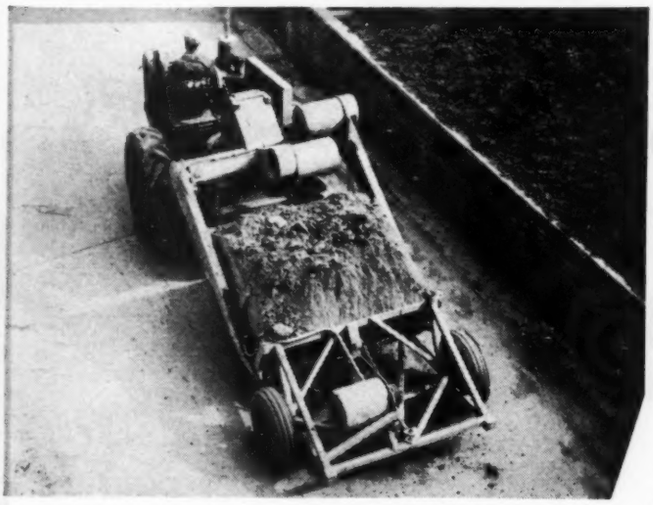
Builds access or feeder roads

One man with a D Tournapull can build a short access or feeder road in a matter of hours . . . handle the complete job, from excavation and ditching to finished grade and graveling. No other labor or work equipment needed . . . no time lost waiting for trailer.



Ideal tool for farm contracting

Here's your chance to develop a profitable one-man business . . . digging stock ponds . . . terracing . . . leveling feed lots . . . building soil saving dams . . . spreading top soil . . . reclaiming peat land. Rig handles up to a half-dozen small jobs per day at a good profit.



Travels Job-to-Job

High-speed, rubber-tired travel on pavement or cross country simplifies job-to-job moves in any weather or season. 20 miles is less than an hour away. Just hop on and go . . . move your dirt . . . move on. Simple, fast, economical!

Handles Materials, Stockpiling

If you have materials to handle, stockpiling problems . . . crushed stone, cinders, coal, fertilizer . . . this handy one-man, self-powered Scraper handles these odd jobs fast and economically. Loads, hauls, piles, spreads . . . can dump from ramp to trucks, conveyors or screens.

LETOURNEAU PEORIA, ILLINOIS — HIGH-SPEED UTILITY — TOURNAPULLS

LIFT! LOAD! HAUL! DIG!

WITH A UNIT 357 MOBILE CRANE

IT'S SELF-PROPELLED

IT RIDES ON RUBBER

IT HAS 1001 USES

The UNIT 357 Mobile Crane is designed to handle a wide variety of jobs both on and off the highway. Compact . . . it works efficiently in close quarters. Sufficiently narrow for convenient road travel . . . and as easy to handle as an automobile.

Operated by ONE man . . . Powered by ONE engine . . . Full Vision Cab gives operator complete visibility in every direction.

The complete UNIT 357 story . . . its Low Cost . . . its Fast Delivery . . . its many modern and exclusive features will convince you. Write for it today!

CONTACT FACTORY DIRECT FOR PRICE AND DELIVERY

or See Your Dealer

UNIT CRANE and SHOVEL CORP., 6407 W. Burnham St., Milwaukee 14, Wis., U.S.A.

GOING UP! FOR A NEW HIGH IN VERSATILITY

In the Ransome 34E Blue Brute Paver, with elevated boom attachment, you have a mobile, all-purpose mixing plant that can take a lot of *different*, off-highway jobs in its stride.

High foundation walls, isolated bridge piers and other hard-to-get-at spots are easily reached by the fast-swinging "live" boom that raises the discharge bucket to a 20-ft. clearance. And the positive hydraulic operation of both boom and bucket assures exact pouring-control, eliminating the need — and the risk — of a man to manually discharge the bucket at the top of a high form or batch hopper.

More Ransome Advantages

Features like these — automatic bucket-lock that prevents accidents when operating with elevated boom; unobstructed bucket opening that eliminates segregation; wide, long crawlers that go almost anywhere regardless of mud, sand or rough ground — all pile up proof that Ransome 34E Pavers, Single Drum or Dual Drum, can go farther, do more work faster, and cut costs every foot of the way.

Write for *all* the facts. Learn why *there's more worth in a Blue Brute.*

R7.6

BUY BLUE BRUTES

KNOW YOUR

BLUE BRUTES

Your Blue Brute Distributor will be glad to show you how Worthington-Ransome construction equipment will put your jobs on a profitable basis.

RANSOME EQUIPMENT

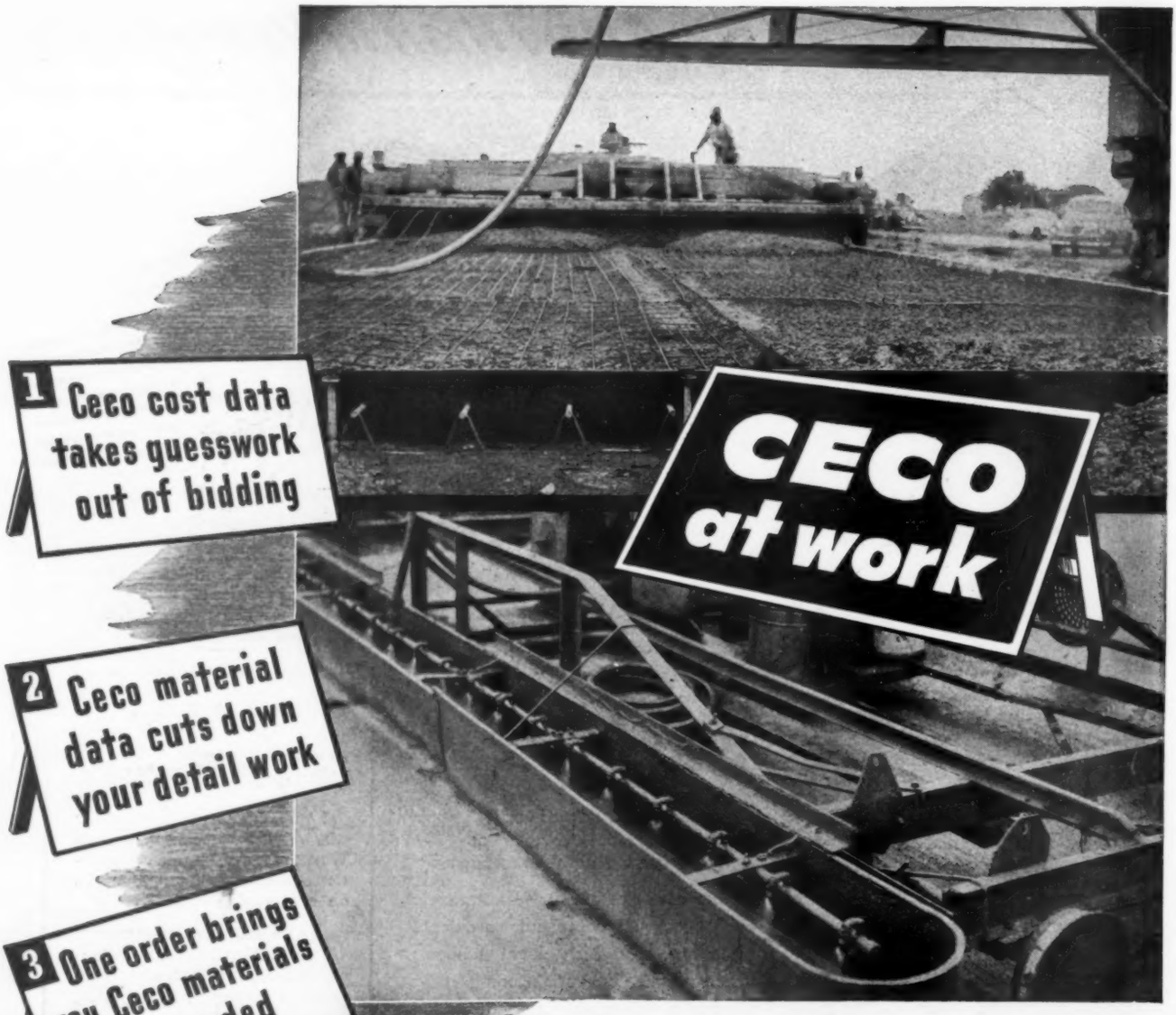
Pavers, Portable and Stationary Mixers, Truck Mixers, Pneumatic Placing and Grouting Equipment and Accessories.

WORTHINGTON EQUIPMENT

Gasoline and Diesel Driven Portable Compressors, Rock Drills, Air Tools, Self-Priming Centrifugal Pumps and Accessories.

WORTHINGTON

Worthington Pump and Machinery Corporation, Worthington-Ransome Construction Equipment Division, Holyoke, Mass.


1 Ceco cost data takes guesswork out of bidding
CECO at work
2 Ceco material data cuts down your detail work
3 One order brings you Ceco materials as needed

A 3 Point Program for Surer Road Building Profits

CECO offers you more than precision road building materials. It offers you a 3-point program for surer profits based on construction knowledge gained from years of practical experience. Call any one of 23 offices located coast to coast, for engineering skill and fine road building materials . . . plus a plan for road building profits. Remember Ceco's 3-point program takes the guesswork out of bidding, cuts down your detail work and one order brings you materials where you need them, when you need them.

CECO STEEL PRODUCTS CORPORATION
GENERAL OFFICES: 5701 West 26th Street, Chicago 50, Illinois

CECO STEEL

TYPICAL CECO HIGHWAY PRODUCTS • Welded Wire Fabric • Metal Center Strips
Cecure Curing Compound • Reinforcing Steel • Load Transfer Devices • Joint Sealing Compound
Dowel Bar Supports and Sockets • Stake Pins • Expansion Joints • Sub-Grade Paper

In construction products **CECO ENGINEERING** *makes the big difference*

No Seasonal "Down-Time" when you . . .

TRAXCAVATE!

Year around PERFORMANCE makes your Equipment Dollars do Double Duty

GREAT workers, TRAXCAVATORS! On your spring and summer road and street work these versatile machines can be used for (1) digging and loading sand, gravel or borrow material; (2) ripping up and loading old pavement; they can also (3) clean leaves from gutters in the fall; (4) remove snow in the winter. TRAXCAVATOR versatility only begins here. Many other jobs, such as excavating, dirt-moving, loading from stock piles, grading, leveling, ditching, park and playground work, removing trees, terracing are made-to-order for these multi-purpose machines.

TRAXCAVATORS, powered by "Caterpillar" track-type tractors, are highly mobile, easy to transport on streets and highways — available in four sizes with bucket capacities from ½ to 4 cubic yards. Bulldozer blade and ANGLEGRADER attachments are also available to further increase TRAXCAVATORS' usefulness. Ask your TRACKSON-"Caterpillar" dealer for the facts, or write Dept. RS-97, TRACKSON COMPANY, Milwaukee 1, Wis.

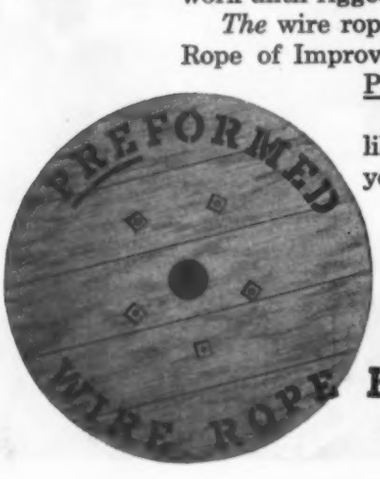
What's missing in this picture?

Thousands of dollars for this Crane —*but it can't work!*

● This crane erected on the job cost $41,000. But it can't do a nickel's worth of work until rigged with wire rope costing a fraction of that amount.

The wire rope used makes a big difference, yet for this job Preformed Wire Rope of Improved Plow Steel . . . the best there is . . . costs only about $300. Preformed permits faster, better work, with fewer shutdowns.

Management likes Preformed because it lasts longer. Workmen like it because it's easier and safer to handle. Get the most out of your machines by specifying Preformed of Improved Plow Steel.



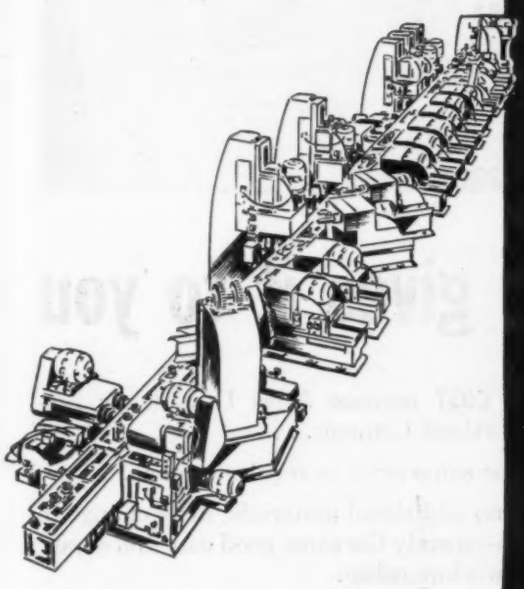
SEND FOR FREE COPY of informative book about Preformed. Address: Preformed Wire Rope Information Bureau, 520 N. Michigan Ave., Chicago 11.

ASK YOUR OWN WIRE ROPE MANUFACTURER OR DISTRIBUTOR

HANDLES EASIER - LASTS LONGER

In More Than 30 Booths at the MACHINE TOOL SHOW...

YOU WILL SEE THE Many Applications OF VICKERS HYDRAULIC CONTROLS



Machine Tool Builders use Vickers Hydraulic Equipment to meet the ever increasing demand for Higher Production Rates, Reduced Parts Costs and Improved Product Quality

Vickers Hydraulic Controls have played a significant part in the development of many modern machine tools because they provide the designer with opportunities for improvement not available by other methods. From simple machine tools to completely automatic processing machines, Vickers Hydraulic Equipment makes good machines even better.

You can see the many advantages which Vickers Hydraulic Controls have contributed to modern machine tools in more than 30 booths at the Machine Tool Show—booths of machine tool builders who are displaying Vickers Hydraulic equipped machines of many types. It will be very much worth your while to inspect these machines.

To make it easy for you to find these exhibits, we have prepared a booklet illustrating the machines, listing the names of the manufacturers and showing their booth locations. Stop at Vickers Booth No. 228 for your copy.

BOOTH 228

Here you will see the latest developments in Vickers Hydraulic Controls. Vickers Application Engineers will be glad to discuss your individual problems.

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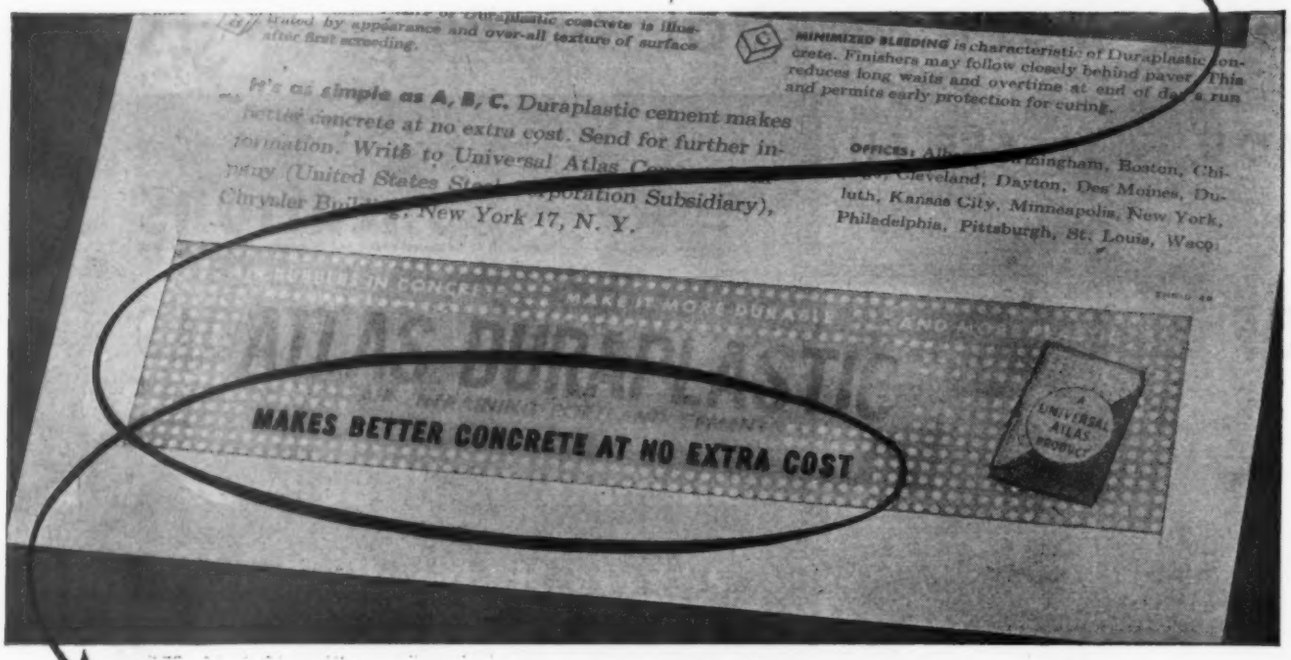
3241

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

What's behind this fact . . .


MINIMIZED BLEEDING is characteristic of Duraplastic concrete. Finishers may follow closely behind paver. This reduces long waits and overtime at end of day's run and permits early protection for curing.
It's as simple as A, B, C. Duraplastic cement makes better concrete at no extra cost. Send for further information. Write to Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.
OFFICES: Albany, Birmingham, Boston, Chicago, Cleveland, Dayton, Des Moines, Duluth, Kansas City, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, Waco
MAKES BETTER CONCRETE AT NO EXTRA COST
A UNIVERSAL ATLAS PRODUCT

. . . and how DURAPLASTIC gives it to you

MAKES BETTER CONCRETE because Atlas Duraplastic Air-Entraining Portland Cement . . .

. . . Provides the proper amount of entrained air needed for satisfactory field performance. Complies with ASTM and Federal Specifications.

. . . Makes concrete more workable, more plastic and more uniform.

. . . Makes more durable concrete. Fortifies the concrete against freezing and thawing weather. Renders paving concrete highly resistant to scaling action of de-icing salts.

. . . Makes better concrete block. Reduces breakage, improves appearance, lowers water absorption and generally increases strength.

AT NO EXTRA COST because Atlas Duraplastic Air-Entraining Portland Cement . . .

. . . Sells at the same price as regular cement.

. . . Calls for no additional materials, little change in procedure—merely the same good care and supervision of workmanship.

. . . Is easier to handle. On paving concrete, promotes speed on the job, permits finishers to follow closer behind the mixer, cuts down overtime at end of day.

Send for further information. Write Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

OFFICES: Albany, Birmingham, Boston, Chicago, Cleveland, Dayton, Des Moines, Duluth, Kansas City, Minneapolis, New York, Philadelphia Pittsburgh, St. Louis, Waco.

R8-D-53

ATLAS DURAPLASTIC

TRADE MARK REG. U. A. C. CO.

AIR-ENTRAINING PORTLAND CEMENT

MAKES BETTER CONCRETE AT NO EXTRA COST

"THE THEATRE GUILD ON THE AIR"—Sponsored by U. S. Steel Subsidiaries—Sunday Evenings—September to June—ABC Network

W
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What becomes of them?

Last night another trainload of "Caterpillar" products rolled out of the yards. With the factory's peacetime production at an all-time high, such scenes are of daily occurrence.

So, you ask, why the "scarcity"? . . . What becomes of all these thousands of Diesel-powered tractors, engines, motor graders and units of earthmoving equipment?

That's a fair question. Especially if you are a customer who has been patiently awaiting delivery on an order. Here is the answer:

"Caterpillar" products have gained unprecedented demand that takes time to supply. It is a demand that has been built up through sheer excellence of quality . . . through tireless engineering research and job study that have made them better and better . . . through their illustrious war record and their versatility for serving many industries.

In fact, "Caterpillar" power has become woven into the very fabric of our economy and progress. Big-scale utility, reclamation and conservation projects could scarcely proceed without it. Agriculture needs it. Logging demands it. It is a "must" on highway construction and maintenance. Mining, excavating, quarrying, oil drilling, community lighting, fishing, hatcheries, milling, cotton-ginning, machine shops, switching locomotives, factories—all find "Caterpillar" power a key to a successful public service.

So, you see, the "world of 'Caterpillar' Diesels" is a big one. The needs that "Caterpillar" must supply are many. The ultimate destinations of every trainload of "Caterpillar" products are widely scattered.

To allocate the factory's output is no small problem. Apportionment is fair—by regions and by industries. Priority of orders is the reasonable basis for customer deliveries. "Caterpillar" subscribes firmly to that principle. So do "Caterpillar" dealers, whose responsibility it is to carry it out. Each is a businessman of ability and integrity, who merits the confidence of his customers and his company.

Caterpillar Tractor Co., San Leandro, Calif.; Peoria, Ill.

CATERPILLAR
REG. U. S. PAT. OFF.
DIESEL ENGINES • TRACTORS
MOTOR GRADERS
EARTHMOVING EQUIPMENT

TRUSCON WELDED STEEL FABRIC

Equalizes Load Stress and Helps Maintain High Pavement Efficiency
Note that as heavy wheel load approaches crack in plain pavement, slab end carries entire load weight with no assistance from non-loaded slabs.
Plain Pavement
Open Crack
Structural Action at Crack in Plain, Non-Reinforced Pavement
Reinforced Pavement
Closed Crack
Structural Action at Crack in Truscon Welded Steel Fabric-Reinforced Pavement
As wheel load approaches closed crack in Truscon Welded Steel Fabric reinforced pavement, aggregate interlock renders the crack-joint shear resistant, and *both* slab ends, instead of one, carry the load.

● The tremendous landing impact of giant aircraft is no greater than that to which almost every square foot of your highways is subjected each day. The use of Truscon Welded Steel Fabric for reinforcement is highly desirable. Authoritative and official loading tests prove that cracks in reinforced concrete pavements consistently average a load transfer of about 48% at all seasons of the year. This value represents practically 100% shear-resisting capacity, since a load transfer of 50% is the absolute maximum that could occur theoretically under any conditions.

Cracking in concrete pavements cannot be eliminated entirely, but experience has proved that when the pavement slab is reinforced with Welded Steel Fabric between joints, the formation of wide cracks is prevented. The reinforcing holds the aggregate of the fractured slabs in close contact and enables the slab to function as a unit rather than as individual parts.

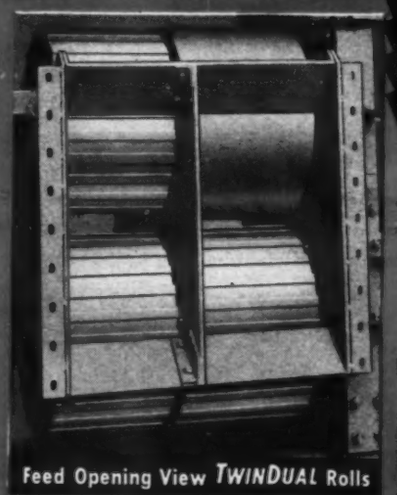
You can be sure that Truscon Welded Steel Fabric Reinforcement, and associated Truscon steel roadbuilding products, will build better, lower-cost roads for the communities you serve, and greater prestige for you.

TRUSCON STEEL COMPANY
Reg. U. S. Pat. Off.
YOUNGSTOWN 1, OHIO • Subsidiary of Republic Steel Corporation

Manufacturers of a Complete Line of Welded Steel Fabric . . . Concrete Bars . . . Contraction Joints . . . Dowel Assembly Units . . . Curb Bars . . . Complete Steel Buildings.

NOW TWICE THE YARDAGE

UNIVERSAL'S NEW TWINDUAL* MASTER GRAVEL PLANT



Feed Opening View *TWINDUAL* Rolls

***TWINDUAL Rolls, the exclusive patented Universal development which gives two full stages of secondary reduction in one crusher. Its use provides amazing capacity with savings in weight. Permits 100% wider jaw crusher discharge opening, more than doubling its capacity and reducing jaw wear.**
***PATENTED**

Top capacity plus *ready portability,* you get both and *more* in the new ***TWINDUAL**** MASTER... the first completely *new* post-war gravel plant. Three full stages of reduction with only two crushers. First stage—jaw crusher; second and third stages—***TWINDUAL**** Rolls. Size for size and weight for weight the ***TWINDUAL**** MASTER has no equal for production where crushing must be done. Under identical pit conditions it has produced twice the yardage of larger conventional model plants. Its record smashing capacity, smooth operation with minimum vibration, and remarkably low power requirement is setting an entirely new standard for low cost production of finished aggregate.

3 STAGES OF REDUCTION WITH ONLY 2 CRUSHERS

Complete details available in bulletin 682. Write for it.

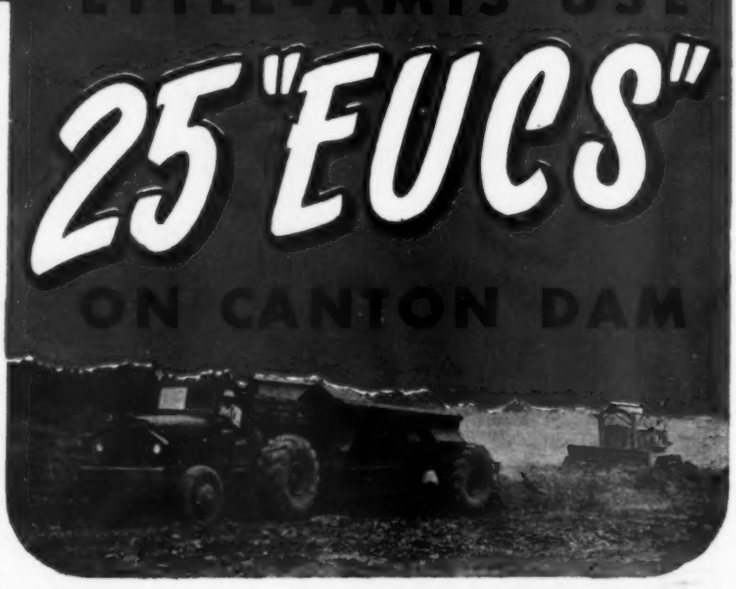
UNIVERSAL ENGINEERING CORPORATION

631 C AVENUE N. W. CEDAR RAPIDS, IOWA

LYTLE-AMIS USE

25 "EUCS"

ON CANTON DAM



Canton Dam, a flood control and irrigation project being built under the supervision of the Corps of Engineers, Tulsa District — will be 14,300 ft. long containing about 5,300,000 cu. yds. of rolled earth fill.

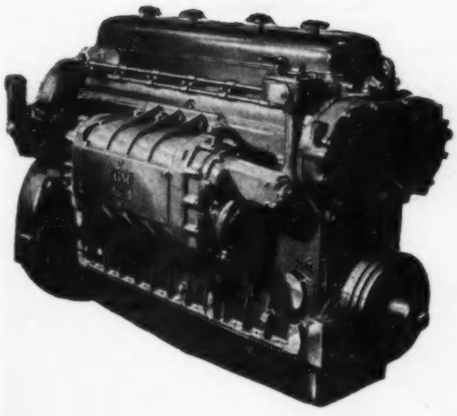
Prior to suspension of work during the war, a large fleet of Bottom-Dump Euclids was used by T. L. James & Co. and Guilliams Bros. When work was resumed in 1946 by C. F. Lytle Co. and Amis Construction Co., Euclid equipment again was selected for this big dirt moving job.

During peak operations more than 20,000 cu. yds. of material a day were placed on the fill by a fleet of 20 Bottom-Dump and 5 Rear-Dump Euclids. Material ranging from blow sand to hard red clay was loaded by two 2½ yd. shovels, two 1½ yd. draglines and a Euclid Loader. Hauls varied from 3,300 to 8,000 feet in length.

Reliable performance and the ability of the Euclids to stay on the job day after day, working two ten-hour shifts much of the time, enabled the contractors to keep well ahead of their earth moving schedule. Your Euclid Distributor or Representative will be glad to show you why Euclid off-the-highway equipment is the choice of many leading contractors and industrial users.

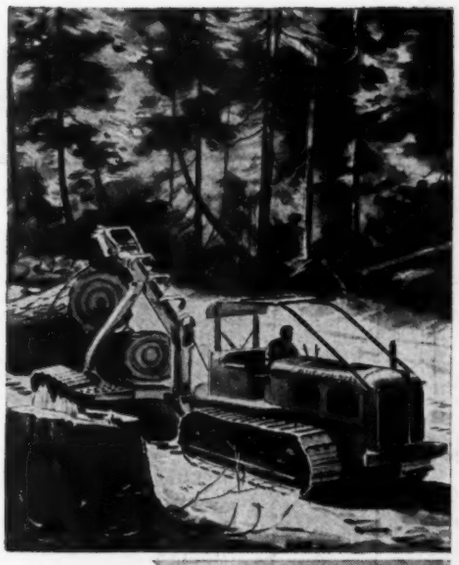
A Euclid Loader working with Bottom-Dumps averaged 525 cu. yds. hourly production despite delays caused by lack of sufficient hauling units.

The EUCLID ROAD MACHINERY Co., Cleveland 17, Ohio



a Smooth Powerful Pull—

because—



There's power at every downstroke!

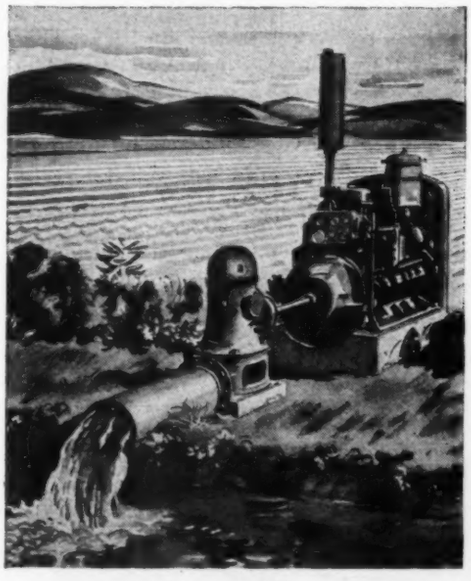
Is yours one of the many industries where power must be smooth and steady—where even the life and worth of the driven equipment depends upon the constant regular pull of the engine?

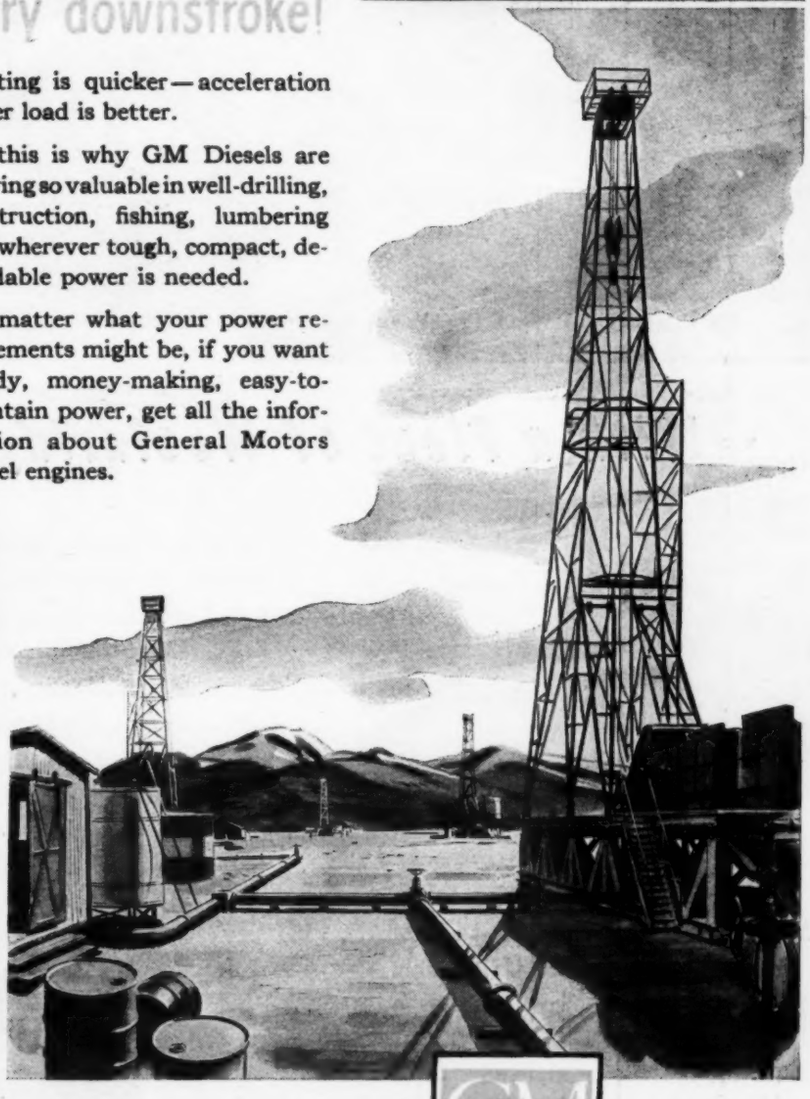
Such smooth and steady pull is an outstanding characteristic of the General Motors Diesel engine. It is the result of this engine's 2-cycle operation with power at every downstroke. Each piston pushes with each turn of the crankshaft.

Starting is quicker—acceleration under load is better.

All this is why GM Diesels are proving so valuable in well-drilling, construction, fishing, lumbering and wherever tough, compact, dependable power is needed.

No matter what your power requirements might be, if you want sturdy, money-making, easy-to-maintain power, get all the information about General Motors Diesel engines.





DETROIT DIESEL ENGINE DIVISION

DETROIT 23, MICH. ● { SINGLE ENGINES .. Up to 200 H.P. / MULTIPLE UNITS .. Up to 800 H.P.

GENERAL MOTORS

GM GENERAL MOTORS DIESEL POWER

DIESEL BRAWN WITHOUT THE BULK

UTAH CONSTRUCTION COMPANY JOB, BINGHAM TO GARFIELD, UTAH

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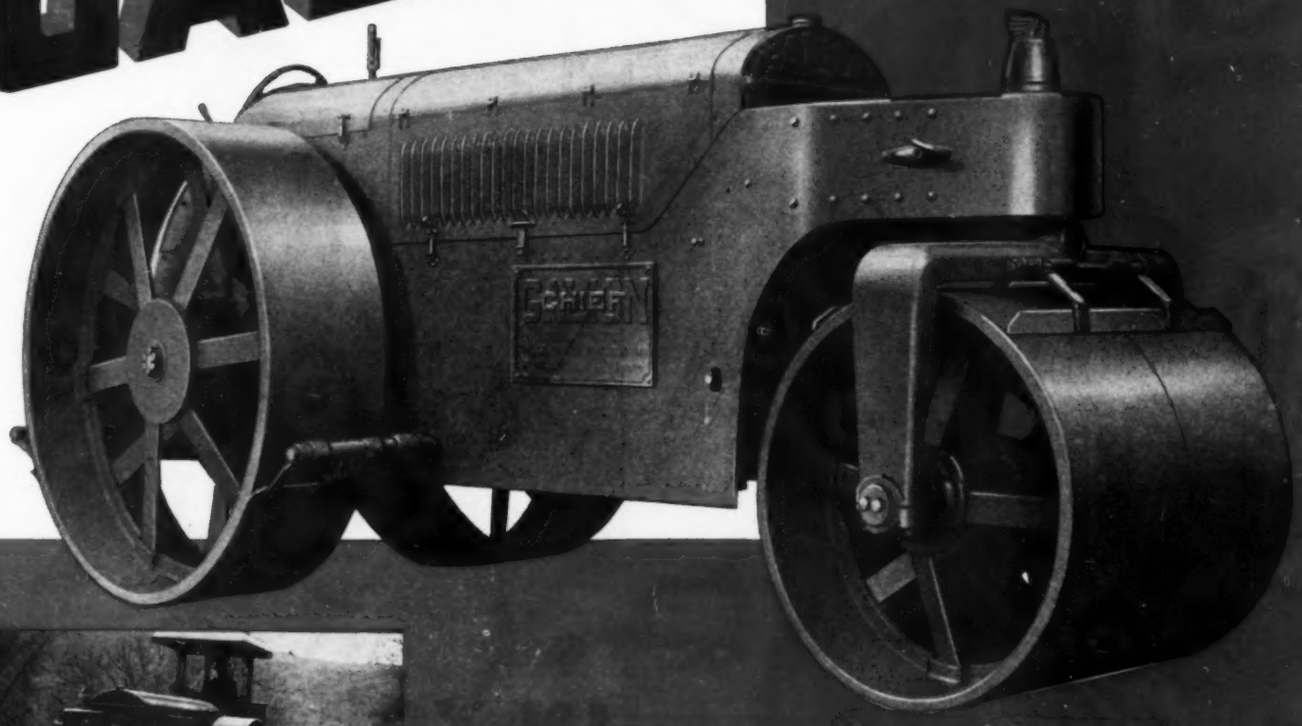

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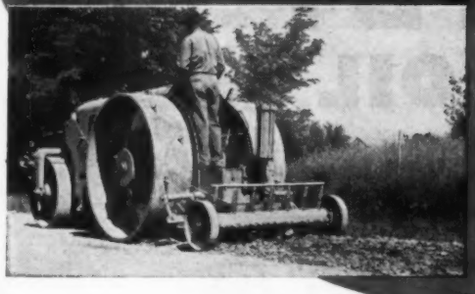

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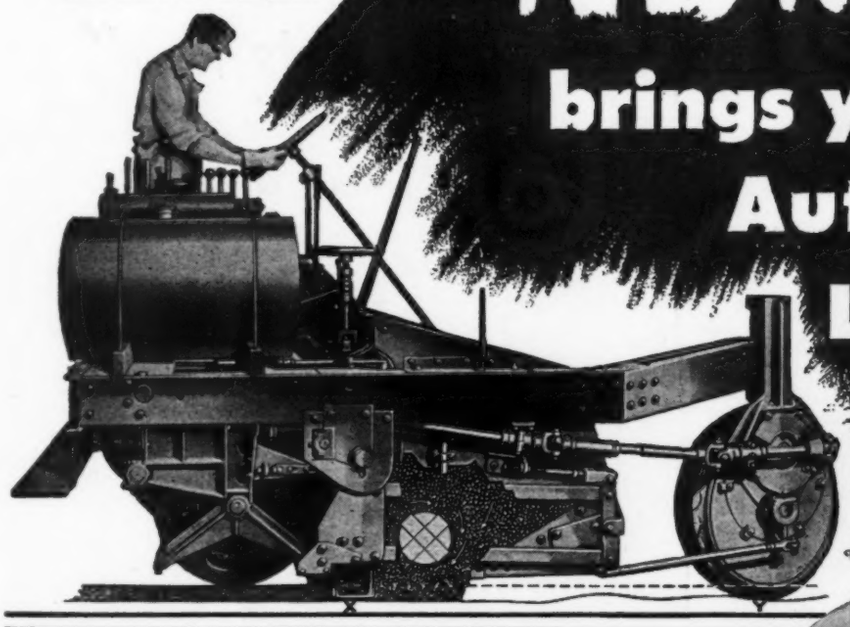
Photo diagram of Adnun showing material being fed to grade. Note that even if a front wheel falls into deep depression at *Y* the deflection of the Cutter Bar Screed at *X* is negligible.



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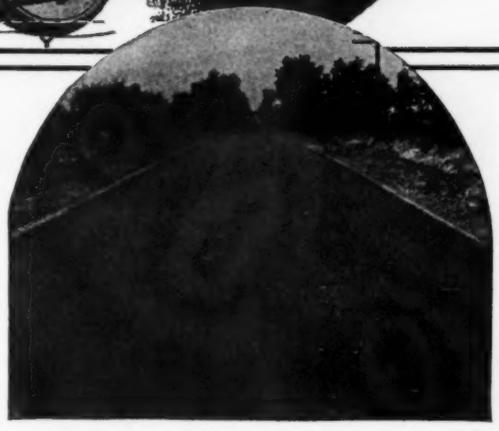

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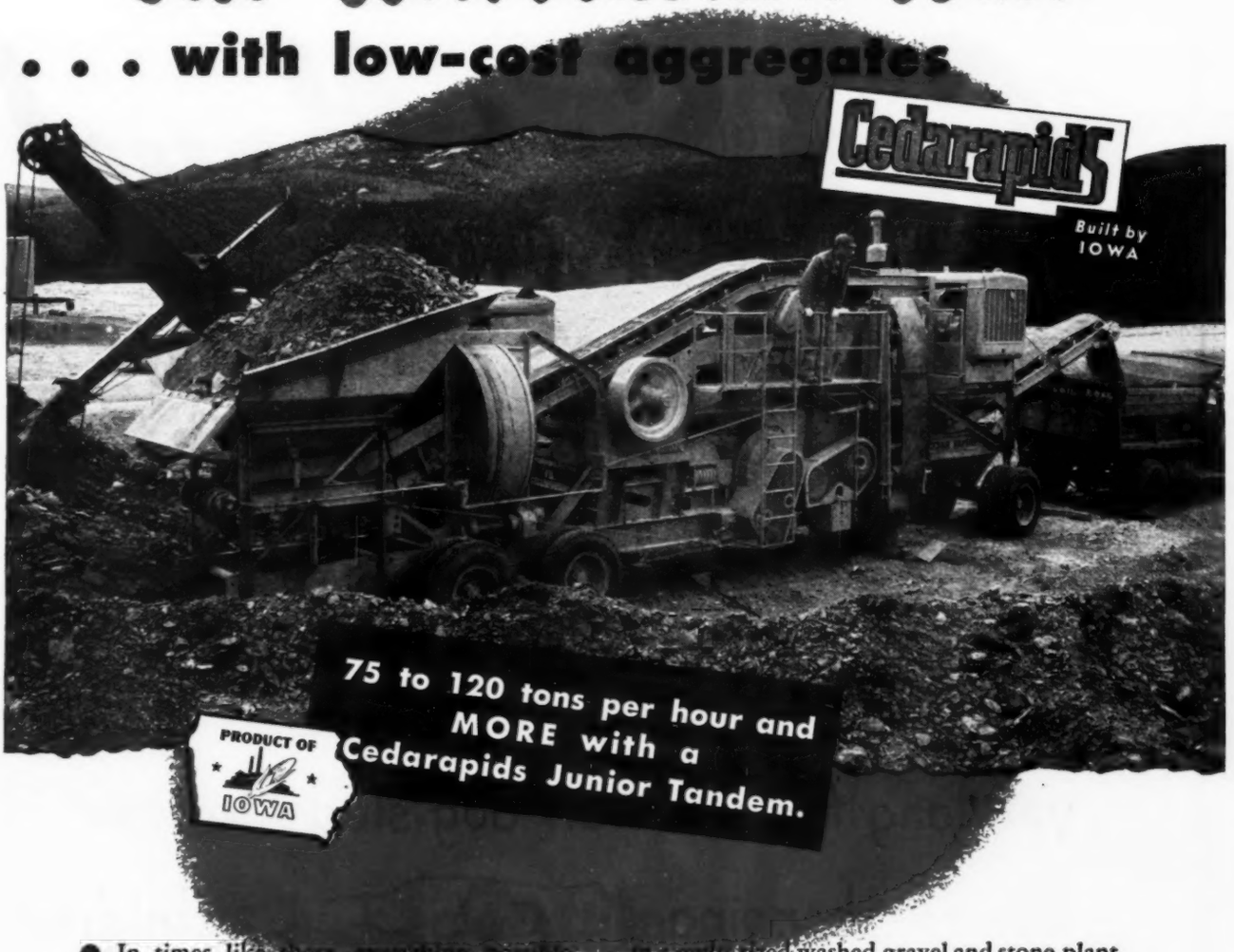
. . . with low-cost aggregates



● In times like these, everything possible must be done to cut the high costs that are retarding construction work of all kinds. Modern crushing and screening plants with low operating and maintenance costs and high capacities will lower the cost of producing one of the basic raw materials. Cedarapids offers the Junior Tandem for that job.

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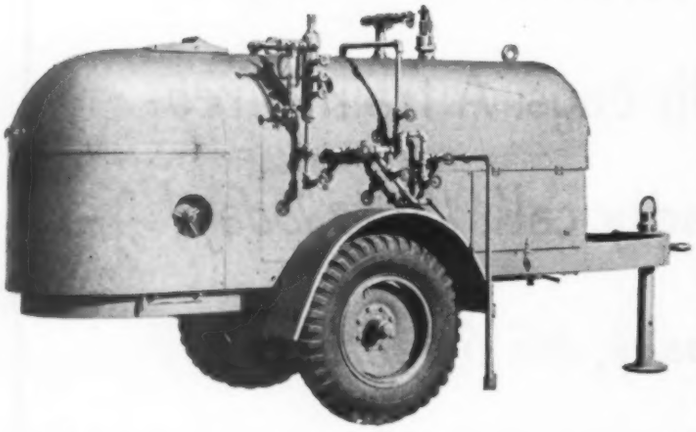

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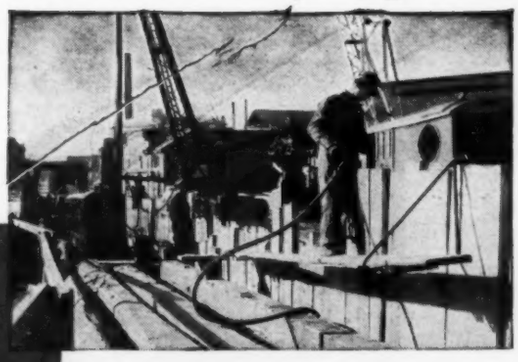

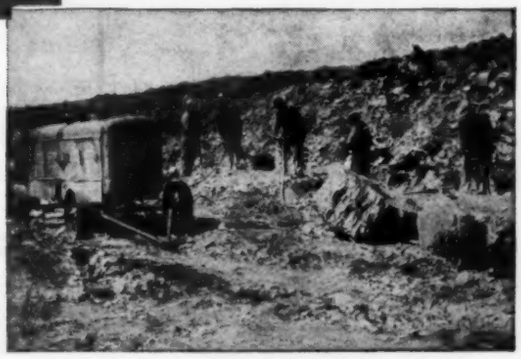

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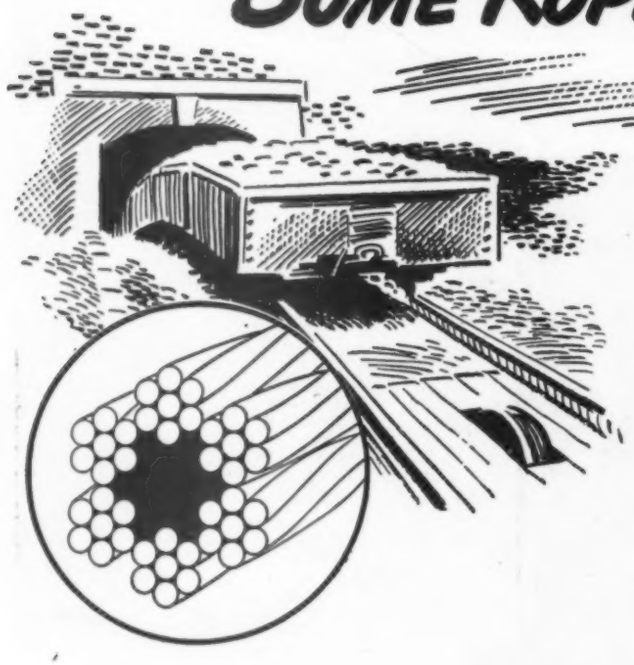

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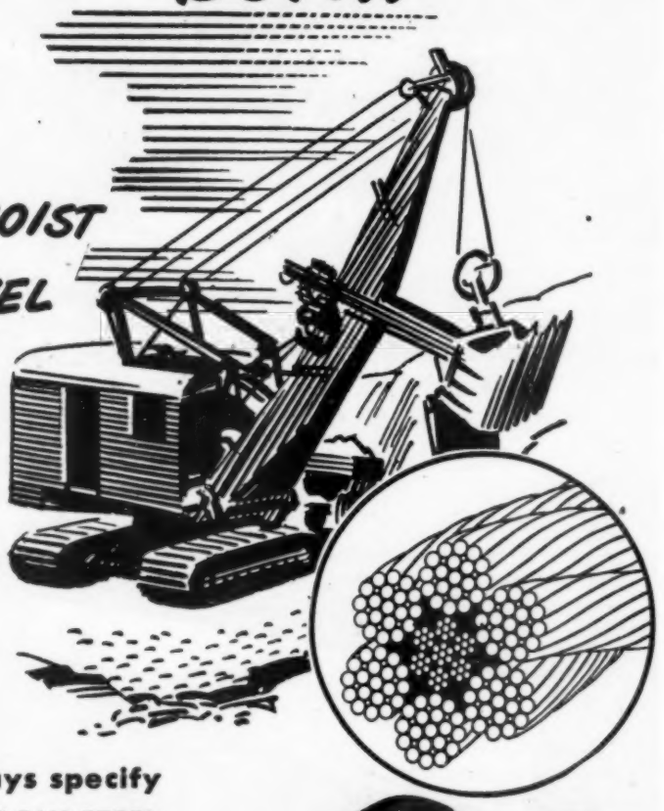

FOR BOOM FALLS AND HOIST ROPES ON A POWER SHOVEL IT'S TOO STIFF. HERE WE RECOMMEND USING U-W 6x19 FILLER WIRE CABLE WHICH IS MUCH MORE FLEXIBLE

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What's the performance tip-off on a *balanced* earthmoving team?

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Your International Industrial Tractor Distributor will gladly give you the full story on these balanced earthmoving teams. Ask him about them —and about the complete line of Bucyrus-Erie tractor equipment as well. Bucyrus-Erie Company, So. Milwaukee, Wisconsin.

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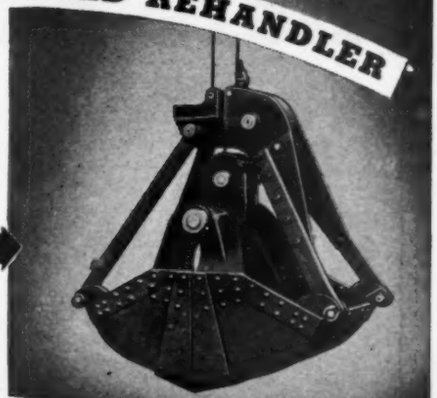

Recommended for general rehandling purposes and particularly efficient for unloading cars. You can work this bucket up to the sides and into the corners, eliminating necessity of hand shoveling to clean the car.

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In clamshell service the bucket is the determining factor in the return on your crane investment. It is essential that size and style of bucket be consistent, both with the work to be done and your crane capacity. You must be able to maneuver to an advantage in order to move economically the maximum payload that your crane can handle at each cycle of operation. Write for new catalog on Erie 2-line clamshells.

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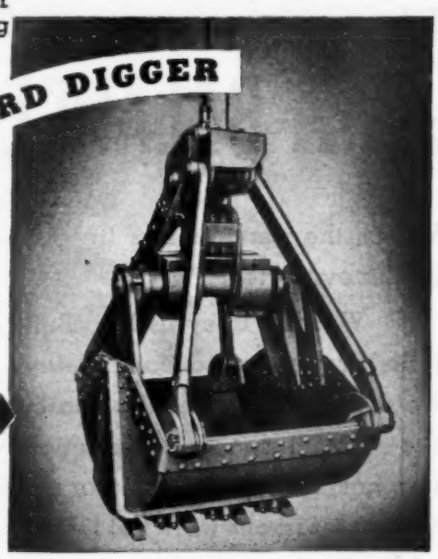

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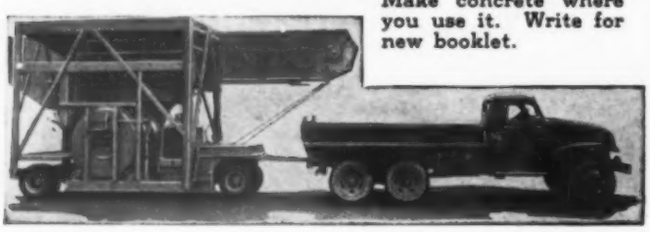
Erie combines an 8 rubber tired chassis with a complete concrete making plant. It includes 20 cu. yd., 3 part storage bin, vertical bucket elevator and weighing Aggre-Meter with extra beam for measuring water. All bin gates are hydraulically operated by fingertip action. Make concrete where you use it. Write for new booklet.



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ERIE GA PORTABLE AGGREMETER PLANTS standardized in 54- 78- or 102 Ton capacities use a specially designed 3-material weighing Aggre-Meter in 1, 1¼, 1½ and 2 cu. yard capacities. We are producing these plants in quantity and can make good delivery. Booklet GA-1 tells its story — Outline your requirements.

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...the smooth, dependable, easy-holding power of LE ROI-CLEVELAND Sinkers reduces drilling costs by drilling more feet of hole per shift—for more shifts

Power for fast drilling in hard rock; power that rotates the steel in "fitchery" formations; power that cleans the holes and improves performance — you get all kinds of power in Le Roi-Cleveland 45-lb. H-10 and 55-lb. H-111 sinkers.

This power, besides producing more feet of hole in a shift, is easy to handle. It is smooth power that seems to flow like the air that drives these outstanding drills. "Kick-back" is reduced to such an extent that both the H-10 and H-111 are easy to run, even on long steels.

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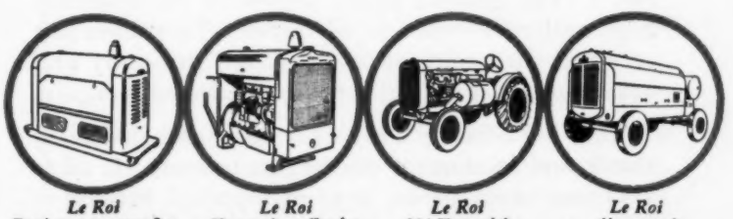
Put Le Roi-Cleveland sinkers to work, and take a big slice out of your drilling costs — shift after shift. See your Le Roi distributor or write for our latest literature.



Le Roi Engine-generator Set | *Le Roi Heavy-duty Engine* | *Le Roi 105 Tractair** | *Le Roi Airmaster**

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NOW! TRACTOR GROUSERS *that* OUTWEAR TRACKS

COLMONOY NO. 1

Insures Traction Efficiency

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Available in many grades, with different properties. There's a grade for every hard-facing operation, including spray welding of Colmonoy in powdered form, using the famous Colmonoy Spraywelder that combines welding and metallizing.

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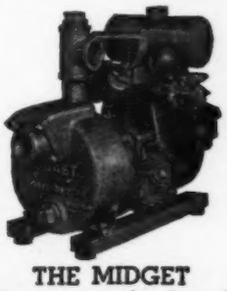
Fitted with pipe or common garden hose, this pump will lift water up to 25 feet. Delivers 8 gal. per min. at 40 lbs. pressure. Electric motor driven — self priming — weighs only 20 lbs.



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The Midget can do hundreds of handy pumping jobs. 3000 GPH at 20 ft. head, 5 ft. suction lift;— and it weighs only 60 lbs.

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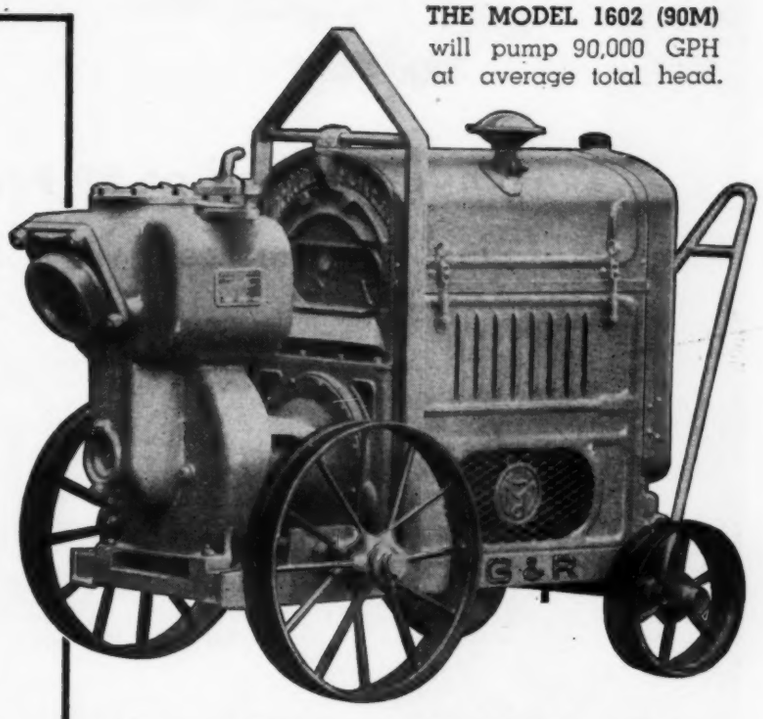
THE MODEL 1602 (90M) will pump 90,000 GPH at average total head.



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Faster Priming — more efficient — just start the motor and you start the water without making any adjustments.

Will not clog — nothing to cause stoppages — no valves, vents or ports — no tubes — no orifices — no clean-out plates.

Whatever the size or application from 3000 GPH up to 25,000 GPH you can do the job more profitably with a dependable Gorman-Rupp Blue Pump.

Write for further information or contact your nearest distributor.

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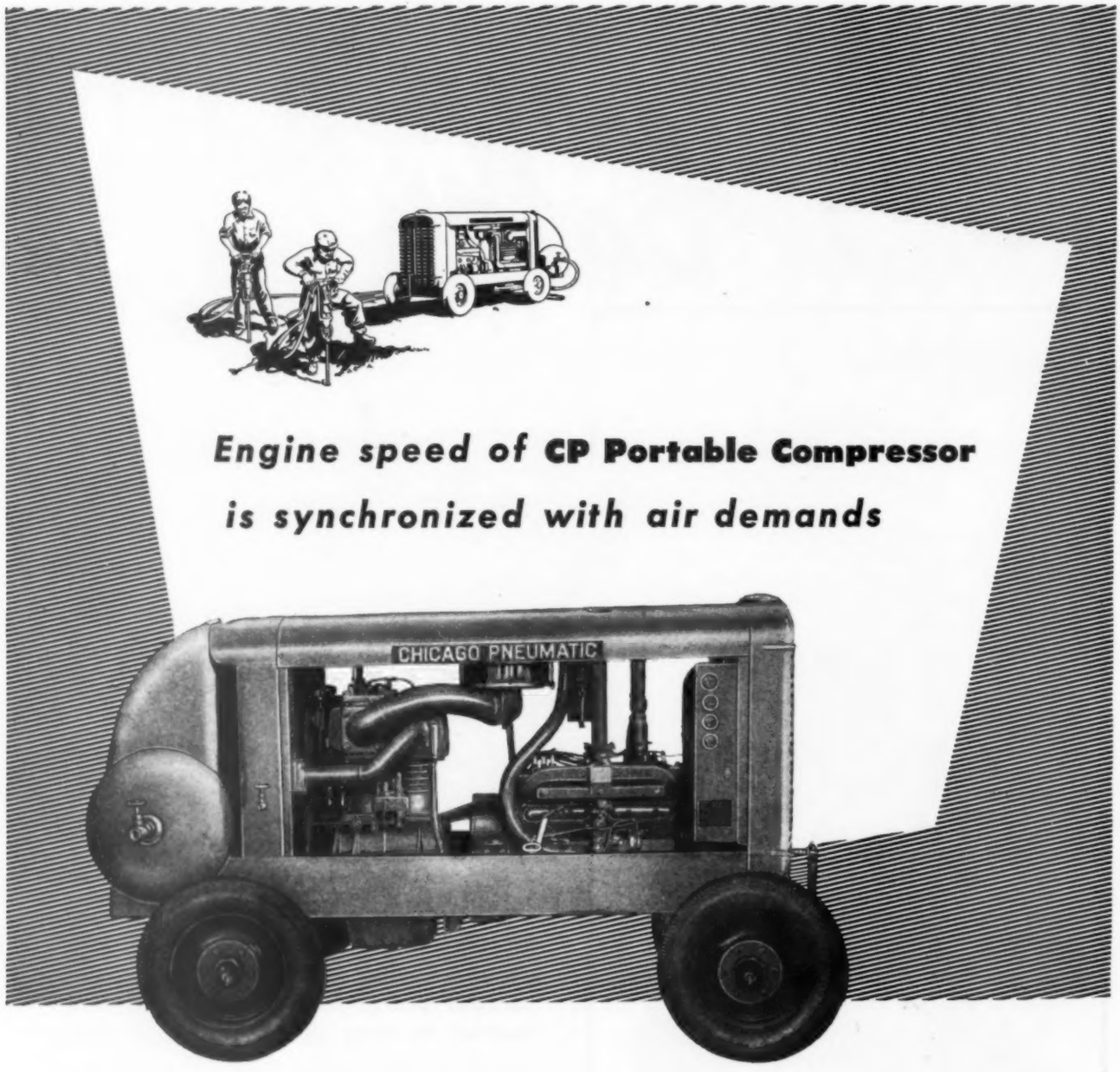

Engine speed of **CP Portable Compressor** *is synchronized with air demands*

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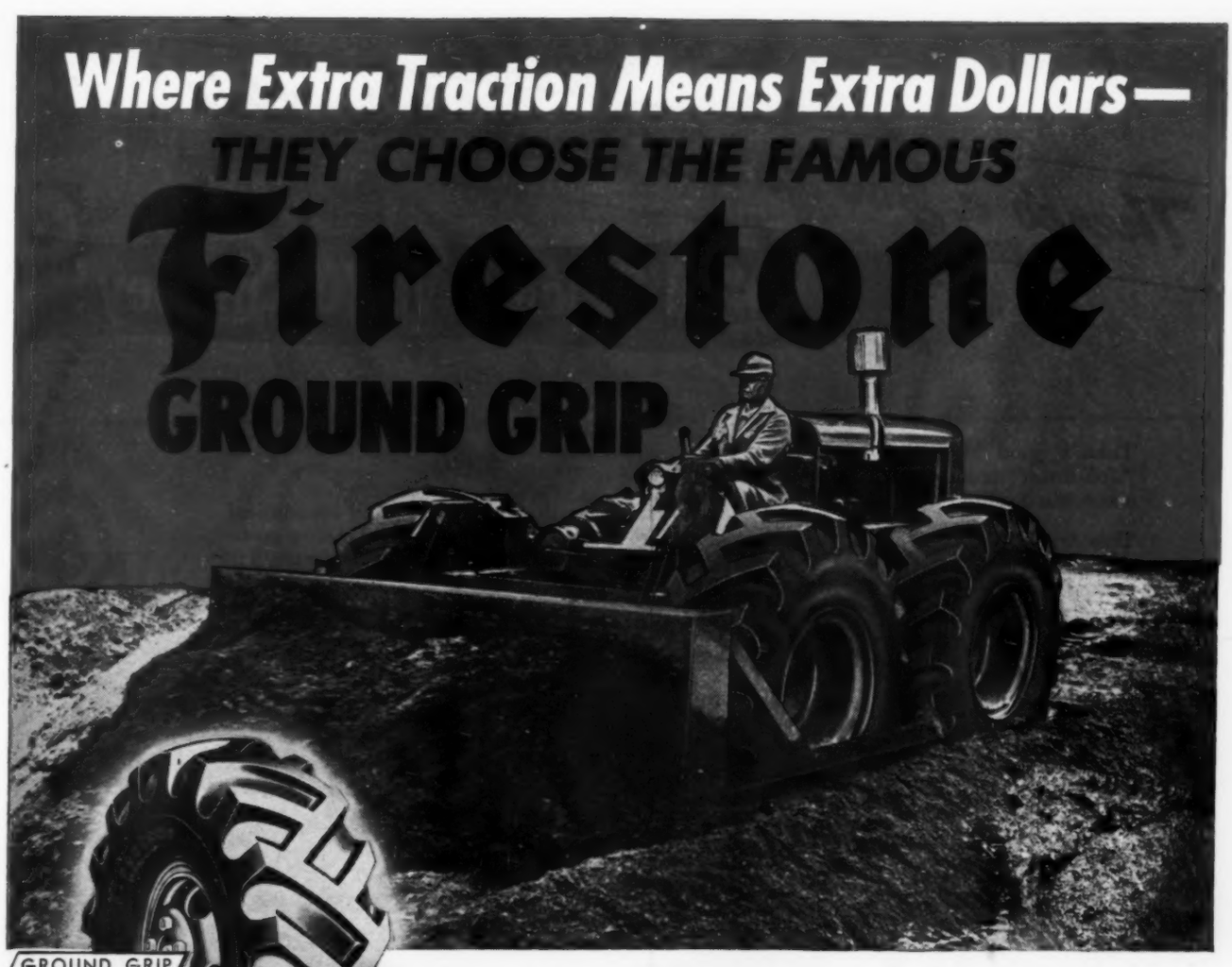

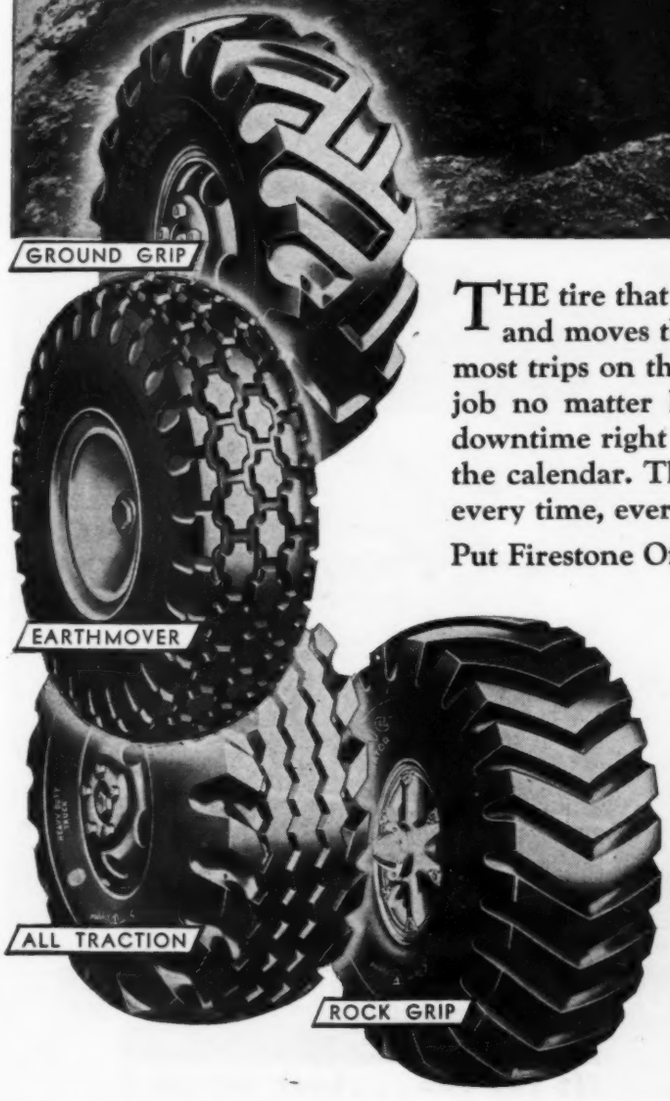

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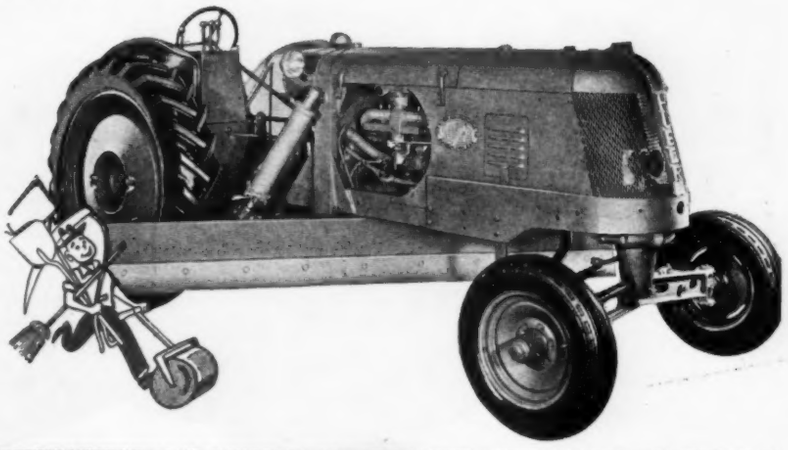
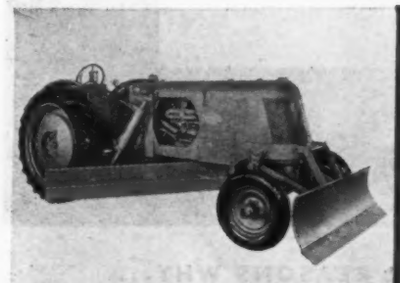
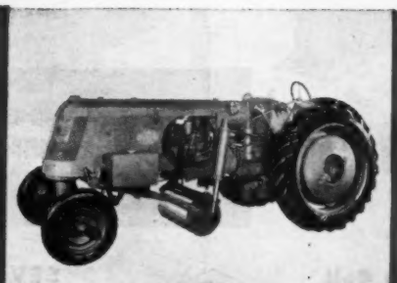
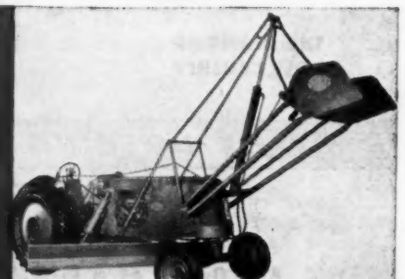




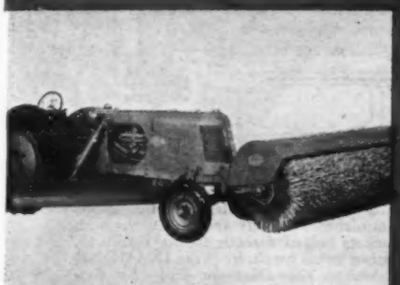
BULLDOZER—Six foot blade cuts one inch below grade—raises to 21 inches above ground level.



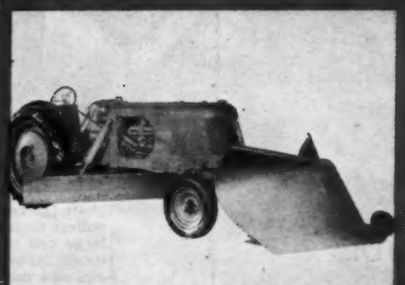
PATCH ROLLER—Pressures up to 150 pounds per square inch obtainable through operation of hydraulic control.



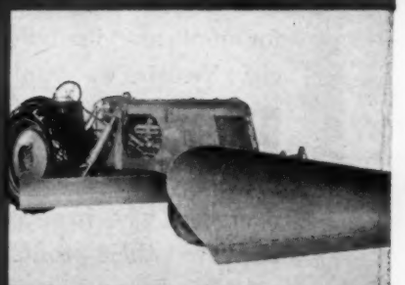
LIFT LOADER—Available with 48" open serial bucket, 60" snow bucket, or 48" coal fork. Lifts [illegible] feet.



ROTARY BROOM—60" Broom riding at 19 degree angle sweeps 73-inch patch. Hydraulic lift control.



V-TYPE SNOWPLOW—Opens 72" lane. Moldboard 31" high at nose, 61" wide at [illegible].



ONE-WAY SNOWPLOW—Blade riding at 38 degree angle opens 73-inch lane.

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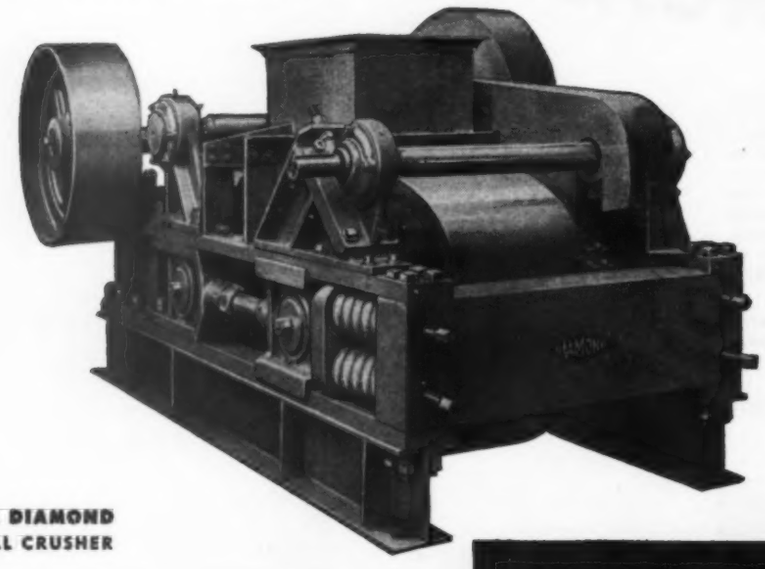

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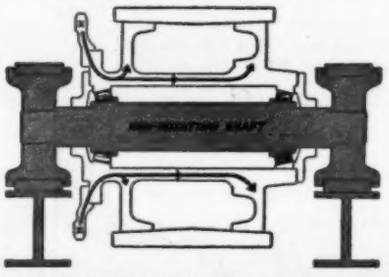
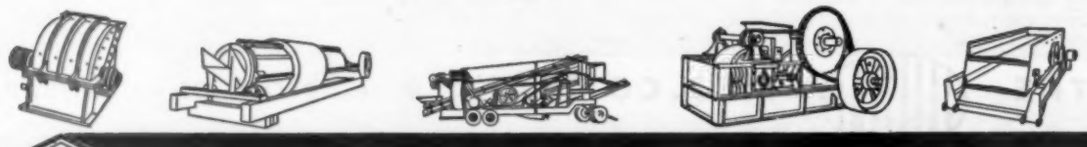


The working rolls of the Diamond rotate on a stationary shaft. Internal housing allows larger roller bearings—more rollers to take the punishment. Rolls are driven through large cast steel sprockets bolted directly to the roll-head, totally relieving twisting stress on shaft. .the DIAMOND can take more punishment. *Your Diamond dealer has Bulletin D-45C—for full specifications.*



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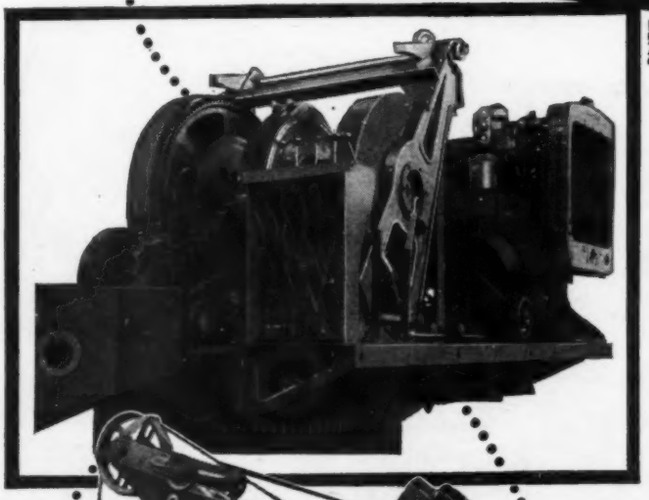

The deck of an OSGOOD is a single, full length steel casting, acting also as support for the engine and counterweight. Unit cast steel construction assures a strong, solid base, free from vibration, that keeps shafts and other operating parts in perfect alignment. All operating machinery is mounted on this deck to provide maximum accessibility.

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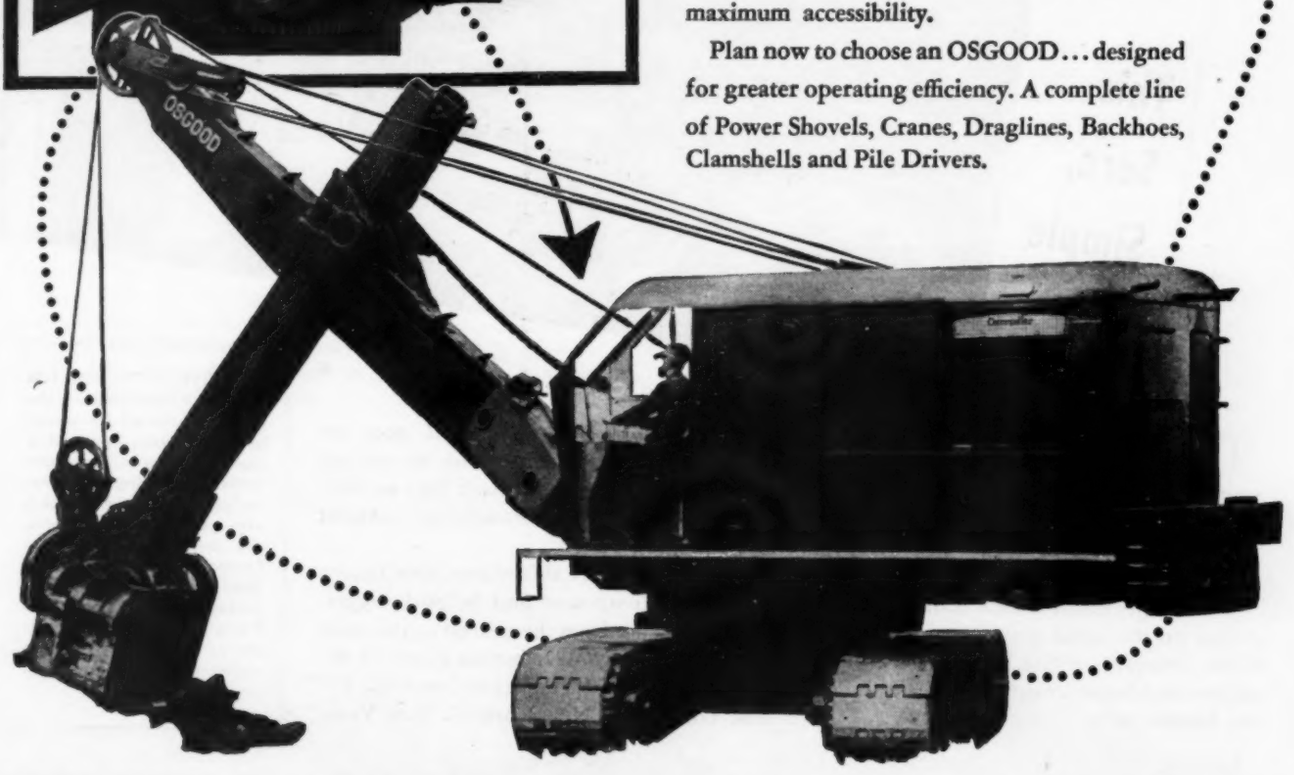

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ROADS AND STREETS

SEPTEMBER, 1947 • VOL. 90 • No. 9

The Maine Turnpike

B. Perini & Sons, Inc., pushing $5,500,000 black-topping contract on 48-mile toll expressway project—nation's largest single post-war road job. How this controversial project came about and some of the design features and construction methods being used

By Harold J. McKeever
Editor, ROADS AND STREETS

LONGEST and most costly single road project in the U. S. since the war, or in fact since the Pennsylvania Turnpike (1937-40), the Maine Turnpike is being paved this year from the New Hampshire border northward to Portland.

It is also one of the liveliest subjects of bar stool controversy in highway circles (see elsewhere in this issue). Hence, when we visited the project with notebook and camera in July, we did so with a special curiosity bump. Mainly, as usual, however our idea was to set down for R and S readers the significant design features and contractor methods observed.

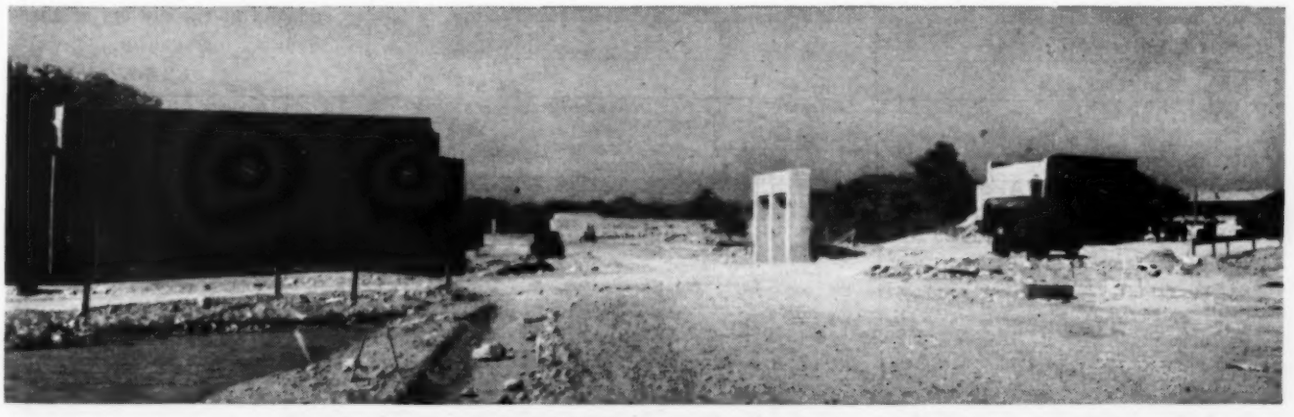
Project's History

Let's begin by briefly summarizing the project's background. For this information we are indebted largely to Williams B. Getchell, Jr., executive director of the Maine Turnpike Authority and one of the spark plugs of the project. Maine, with its relatively small population, has found it difficult to keep up with road needs, even with a 6 cent gas tax wholly applied to highway work and substantial property tax money for roads and municipalities. As in many other states, available funds are proportioned among the counties on a basis that ignores traffic densities. Hence, funds have never been adequate for properly improving the heavily traveled U. S. 1 coastal highway. Local and out-of-state vehicles reach a maximum hourly density of 1,000 to 1,500 in summer, with peak days of 15,000 to 20,000.

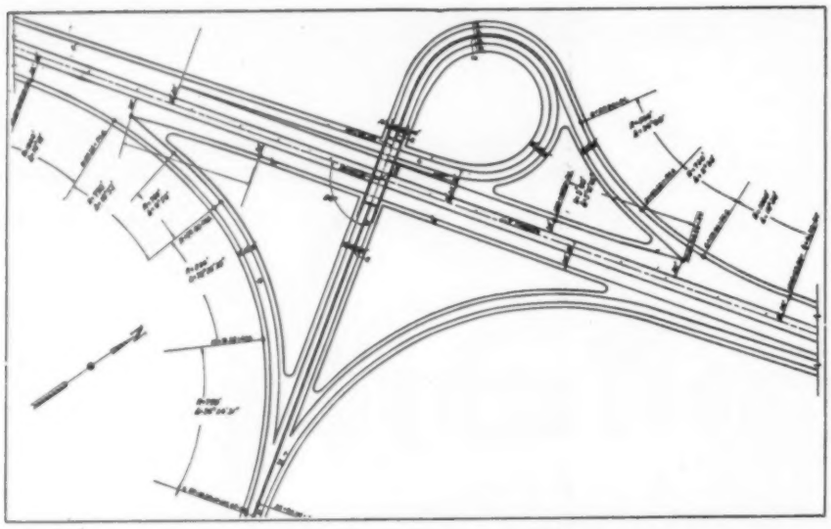
Improvement of U. S. 1 from Portland south has been made piecemeal during the past 20 years, using annual driblets of funds to reconstruct or widen small sections at a time. No great deviation in line was ever undertaken, and the road has continued to thread through an almost continuous succession of towns and cities. Local citizens who live off of vacationists have acted as pressure groups to prevent any major relocation. The result is a road of a type familiar throughout the country—a 3 and 4-lane route jammed with cars and trucks and flanked by activities which generate a continual volume of vehicles and pedestrians entering, leaving and crossing—"unlimited access" at its dangerous worst, as experienced personally by the writer.

Much of the traffic along this route consists of vehicles headed beyond Portland. All traffic clearly would be better served by relegating this road to purely local use and flanking the line of towns by a new off-side route of modern limited-access design.

The controlled access principal was



★ One of the numerous overhead road crossings—U-abutments, I-beam decks



★ Fig. 1. A typical interchange, at one of the three intermediate toll gates

recognized by the Maine legislature in 1939. Finally in 1941, as a result of factual presentation by state highway leaders, the legislature created the Maine Tunpike Authority as a corporate body empowered to "construct, operate and maintain" a turnpike along the Kittery-Portland route and to issue revenue bonds payable solely from tolls to pay the cost of construction. The bonds were not deemed a pledge of state credit or obligation of the state to levy taxation for payment, but redemption rests entirely on toll collections.

The Authority, with present headquarters at Kennebunk, is a five-man appointed body of which the state highway engineer is secretary-treasurer.

Consultants Engaged

Ex-officio membership of the state highway engineer, and employment of an engineer with long experience on Maine highways as executive director, has insured full capitalization of local experience. Late in 1945 the Authority engaged the engineering firm of Coverdale and Colpitts to determine the probable traffic volume on the proposed route. Howard, Needles, Tammen and Bergendoff estimated the probable cost of the project.

From these data the decision was made that the project was feasible and a ready market was secured for $15,000,000 in 2½% 30-year bonds from which construction was initiated early in 1946. Toll rates used in the planning have not been revealed and rate schedules will not be announced until later.

Inflation entered the picture at this point. Grading bids exceeded the estimate by 10%. Bridge bids (Aug. '46) were 42% over, paving awards (Dec. '46) 33% over estimate. Early this year another $5,000,000 in bonds bearing 2¾% were sold to meet increased costs.

Design Speedily Pushed

Early in 1946 a contract was let to E. F. Hughes Company of Boston for borings, which were used as a basis for soils utilization and for base, pavement and structure design.

About the same time the Authority secured the services of the engineering firm of Howard, Needles, Tammen and Bergendoff, of Kansas City and New York, to act as the engineering staff in designing and supervising construction of the entire project. This firm under an initial contract involving some $685,000 immediately put a large staff on location, property surveys and design. It is credited with a show of remarkable speed in developing the design details, construction plans and specifications which made possible the letting of the entire grading work at the start of the 1946 working season. Stewart Associates, of Boston, have performed all routine materials tests and mixture design and inspection under subcontract.

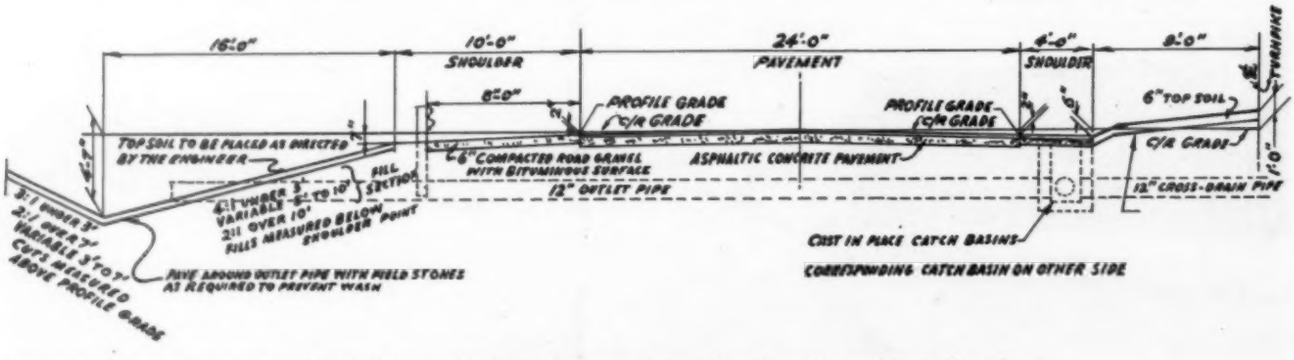
R/W Big Task

After the location was determined, acquisition of a 300-ft. strip of land some 48 miles long was the next big task. It was simplified somewhat by the avoidance of cleared farm land. Some 75% of the right-of-way was covered by small trees and shrubs. Actually only fifteen buildings fell within the strip. The big problem was to determine ancient property lines, and to locate absentee owners. This work was expedited by dividing the strip into three sections, assigning a right-of-way engineer to each under a single negotiator. During the height of the work seven attorneys and two stenographers were employed on the details. Six property survey crews began, dwindling to three as work progressed and the construction started.

–Not an acre of land had been acquired at the time grading contracts were let. But this fact did not hold up construction, thanks to the concerted action described and to a speedy condemnation law in Maine. As it was, 20% of land acquisitions were condemnations, the rest being negotiated. Some 120 parcels or half the condemnation were taken this way in order to secure a good title. The $500,000 for land is indeed a small cost for a project of this size.

Wide Lateral Dimensions

Toll plazas are to be provided at either end and at the outlets of three



★ Fig. 2. The roadway cross section includes a raised rather than a depressed median strip, and lines of catch basins at either inner gutter

intermediate interchanges. Thus there are only five points of access. All other cross roads pass over the highway via grade separation bridges.

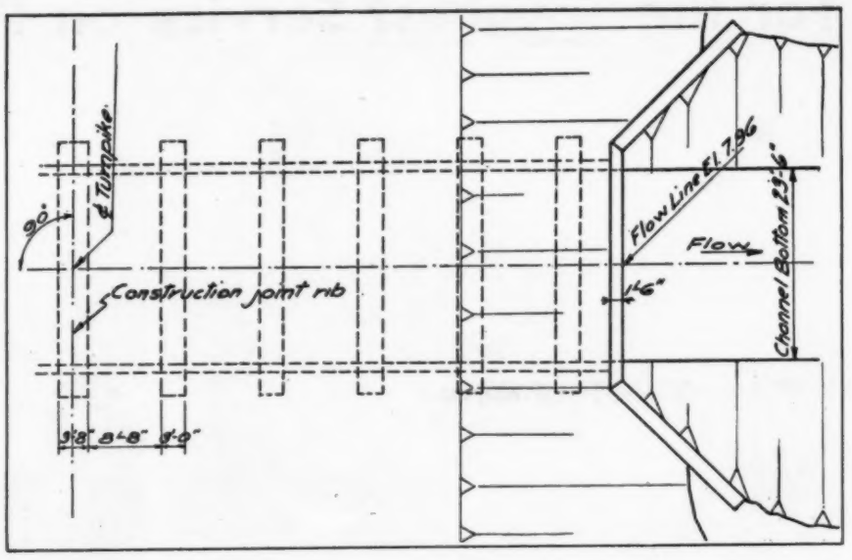
Embodying what the designers consider to be the most successful features of turnpikes and other expressways now in service, the Turnpike will have two 24-ft. paved roadways, flanked by 10-ft. outer and 4-ft. inner armored gravel shoulders.

The median strip is to be of raised, grassed construction, uniformly 18 ft. wide throughout the project and sloping down to inner gutters via a 1'9" strip. The strip is to be sodded in general, armored where the grade exceeds 3%.

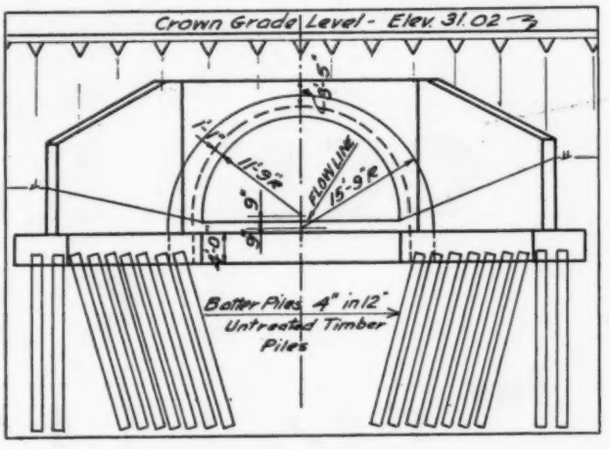
Each roadway is crowned at centerline, the inner lane draining into catch basins along the inner gutter line. The two lines of catch basins, spaced approximately 500 ft. apart, feed into 12-in. lateral concrete pipe drains which thus serve half the pavement area and all the median strip. This design reduces surface drainage across the outer shoulders. Also the double line of inlets provides an added factor of drainage safety in comparison to the alternate of a valley-type grassed median strip which has tendency to clog in summer and to store excessive snow in winter.

Beyond the outer shoulders there is a 16-ft. width of 4 to 1 topsoiled slope to ditch bottoms 126 ft. apart. Ditch bottoms are 4 ft. below and 16 ft. out from outside shoulder edges, thus assuring adequate drainage and also affording large snow storage capacity. Backslopes are sloped 3:1 when under 3 ft. high, 2:1 if over 7 ft. high, and a variable intermediate slope between these dimensions.

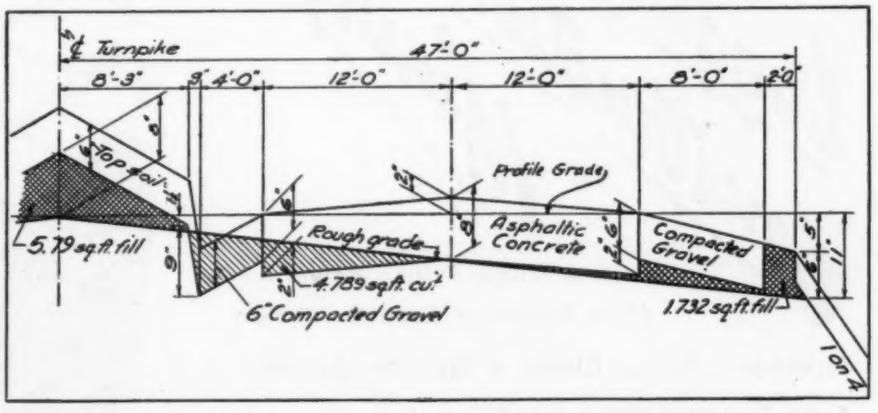
Grades have been kept largely under 3%, but exceed 5% in 3 places. Slightly undulating grades are employed rather than long unbroken grades. The excavation totaling 4,000,000 cu. yd. common and 300,000 cu yd. rock is relatively small for a project of this length and width. Maximum horizontal curvature is 1 degree. Main roadways are without superelevation.



★ Fig. 3. Tied-arch concrete design, used for some of the small stream bridges



★ Fig. 4. Typical grading template sheet, showing what changes the paving contractor makes in the grade as left by the grading contractor



Pavement and Base

The main roadway pavement consists of 2 in. of hot-mixed asphaltic concrete on 5 to 6 in. of hot-mixed asphaltic concrete base, the base thickness varying according to soil and drainage conditions. This admittedly conservative pavement design was adopted after running numerous CBR tests on the subgrade, these tests usually indicating 4 to 5 in. of flexible pavement. Underlying the full roadway shoulder to shoulder is a rolled subbase of selected granular material varying from 2 to 4 ft. in thickness and averaging about 3 ft. Except for a small amount of local swamp material (some 40,000 cu. yd.) the prevailing soil of the area is an A-3 sand which makes an excellent subbase. Some base material has had to be surface stabilized by placement of 2 in. of crushed stone prior to base construction. Three-wheel 18-ton tandem rollers provide subbase compaction and were also used on the hot-mix work.

Ramps and turnouts are of similar construction to main roadways. Shoulders are to be built of compacted gravel with a bituminous penetration surface extending over 8 ft. of the 10 ft. outer shoulder width and over the entire inner shoulder.

The project sets something of a record for hot-mix tonnage, involving 644,000 tons of asphaltic concrete for 1,355,200 sq. yd. of three-course pavement. The 5 to 6-in. base course, designed in accordance with the Asphalt Institute's Mix No. 1, is placed

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Natural Rubber Impact Cushion
Deeper, Cool-Running Shoulders

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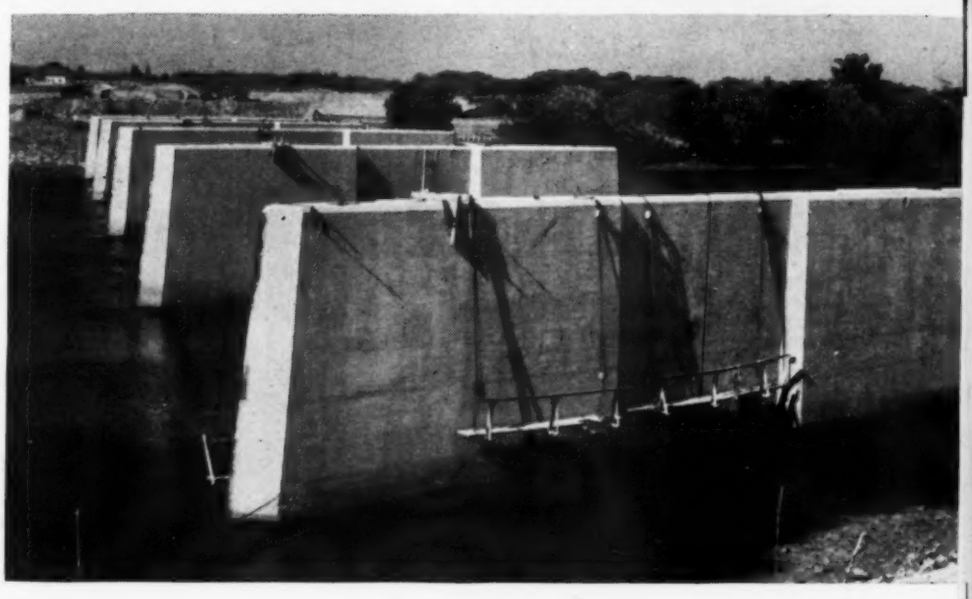
THE GENERAL TIRE & RUBBER CO. • AKRON, OHIO

★ One of the concrete tied-arch culverts, this one having an unusual extended headwall to accommodate the stream direction



★ Saco River bridge, largest of the river crossings, ready for steel. A Crawler crane on an improvised barge was used to set sheeting and handle concreting

and rolled in two layers. Material is graded downward from 2 in. (100% passing 2½). This is the thickest black base ever employed on road work in Maine.

The 2-in. surface course follows the Institute's Mix No. 4, with stone sizes up to 1½-in. maximum. This unusually large maximum was specified as a means of obtaining a slightly rough, open-surfaced texture to prevent development of slipperiness. An unusually hard (85-100 pen.) asphalt was specified for the same reason.

Unusual care was taken to get good aggregate and to insure rigid control of mix production. Density of asphaltic concrete has run to 2.35 or 2.40 throughout the project.

The fine-grain quarry stone employed has tested as low as 14% Los Angeles rattler loss, specifications allowing 25% loss for the surface course. Rattler loss of 40% was allowed for base mix stone to admit local granites, but the contractor elected to use screened gravel.

Big Fencing Job

A notable detail is the use of almost continuous right of way fence. No. 9 wire mesh fence is being used, mounted on emulsified asphalt dipped wood posts except for a few steel posts obtained at the start. Guard rail, also an extensive item, consisting of steel-rail (flex-beam) on wood posts located as determined by the engineers in the field.

Since avoidance of high maintenance cost is essential, special attention is being given to erosion control. Seeding, sodding and planting details are still in the development stage. Where ditch lines are steep enough to warrant, timber ditch checks are to be installed. These consist of 3-ft. lengths of heavy timbers buried vertically across the ditch section and tied together by timber headers.

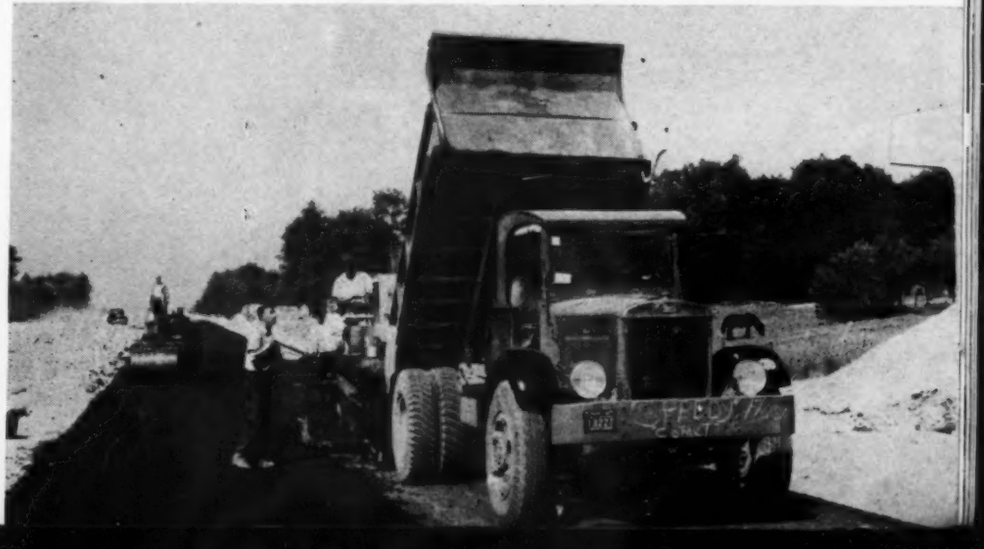
Signing and marking details are still under development. However, it is recognized that signs will play an important part, even though the trip over the project will be an uneventful non-stop one for a large percentage of the drivers. Reflectorized paint will be used for pavement marking. Various types of reflectorizing are under consideration for signs.

43 Bridges Include Unusual Designs

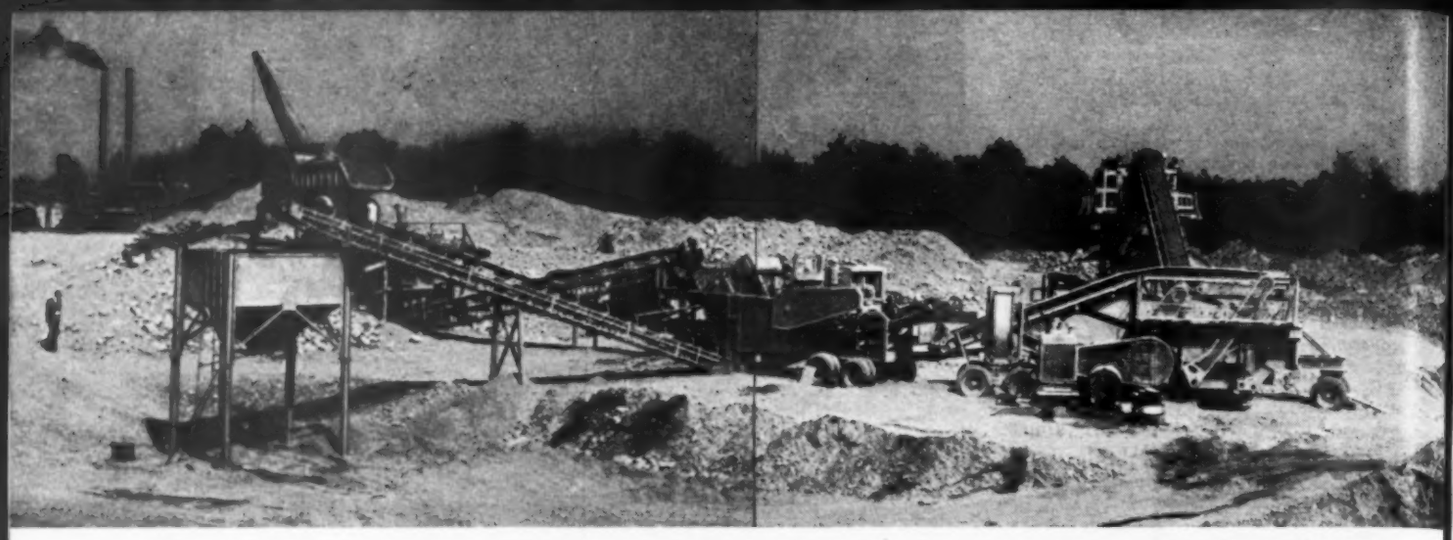
The project includes 43 bridges, of which two are major river crossings and the remainder are creek crossings or highway overpasses. Three-fourths of the structures were under construction by May '47.

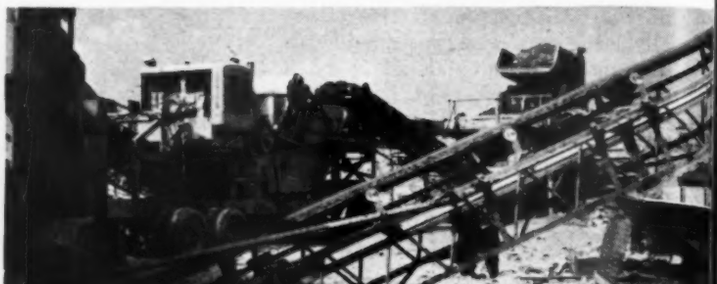
The two river crossings consist in general of wood-pile-supported con-

★ H-piles driven and welded together, ready for abutment pour on Saco River bridge



★ Large modern dump trucks supplied new mechanical finishers to speed hot-mix work





Perini's Hot-Mix Base Plant

Modern is the word for this 220-ton-per-hour plant, set up to produce hot-mix base materials.

It comprises the following elements (mostly Cedar Rapids on the aggregate processing end):

2-yd. Lorain shovel in gravel pit.

Three or four 10-yd. Euclid wagons.

High-level dumping to power feeder.

25 x 40 portable jaw crusher, powered by Caterpillar D 8800 engine and screen.

24 x 40 portable rotary crusher, powered by a 190-hp. Murphy engine.

Belt off jaw crusher and screen to 30-ton sand bin.

Belt from rotary crusher to double 50-ton bin for hot-mix base aggregates.

This plant has run in single 10-hour shifts. Four men including foremen do all the work. No electric motors, just the two belt-connected diesel power plants.

Processed materials are trucked by Perini's fleet of 10-ton Macks to a nearby asphalt plant consisting of two 90-ton Barber Greene units. This plant is powered by six International diesel power plants. Two dryer units are included. A 2-yd. Northwest clamshell with 65 ft. boom feeds bins located at ground level, from which material is belted to the dryer.

crete bents and H-pile supported concrete abutments, with steel deck girders of conventional design. Each bridge consists of a pair of separate structures with open space between, corresponding to the median strip.

Smaller stream bridges are notable for the wide clearance of headwalls beyond shoulders, and especially for the use of an unusual form of structure—the tied arch. As shown in the accompanying design details, a typical bridge of this type is a heavy reinforced-concrete filled arch tied monolithically by intermittent concrete sills embedded in the stream bottom.

Highway overpasses are steel I-

beams on concrete piers and abutments, this simplified form of structure being selected in lieu of rigid-frame or continuous-type construction. Abutments are U-shaped counterfort concrete design, embodying rather unusual detailing, as shown in accompanying sketches and photos.

All structural concrete is designed under a general policy of utilizing rather thin, highly reinforced sections where feasible in the interest of economy. Concrete surfaces are smooth rubbed. No effort has been made to embellish the structures or give them a special "parkway" character beyond tasteful functional treatment.

One of the overpasses is of special interest in that it carries a single-lane local road, its narrow deck being supported by single-columned cantilever-topped concrete piers.

Contractors Who Are Building the Maine Turnpike

(General Contractors)

Grading, Kittery to Kennebunk—Savin Construction Corporation, East Hartford, Conn.

Grading, Kennebunk to Portland—Lane Construction Corp., Meriden, Conn.

Saco River and York River Bridges—Ellis C. Snodgrass, Inc., Portland, Maine.

All other bridges and underpasses (41)—Lane Construction Corporation, Meriden, Conn.

Pavement throughout—B. Perini & Sons, Inc., Framingham, Mass.

(Prime Contracts)

1.	Boring—E. F. Hughes Co.	$ 18,180.56
2.	Grading—Savin	1,195,034.00
3.	Grading—Savin	1,265,075.00
4.	Grading—Lane	1,108,507.50
5.	Grading—Lane	683,220.00
6.	Bridges—Snodgrass	1,102,956.79
7.	Bridges—Lane	3,091,691.00
8.	Pavement—Perini ..	2,901,539.00
9.	Pavement—Perini ..	2,684,045.50
		$14,734,621.31

(Sub-Contractors)

N. D. Masselli Corp., Bloomfield, Conn. (Under Savin)—grading section.

Landers & Griffin, Portsmouth, N. H. (under Lane)—bridges.

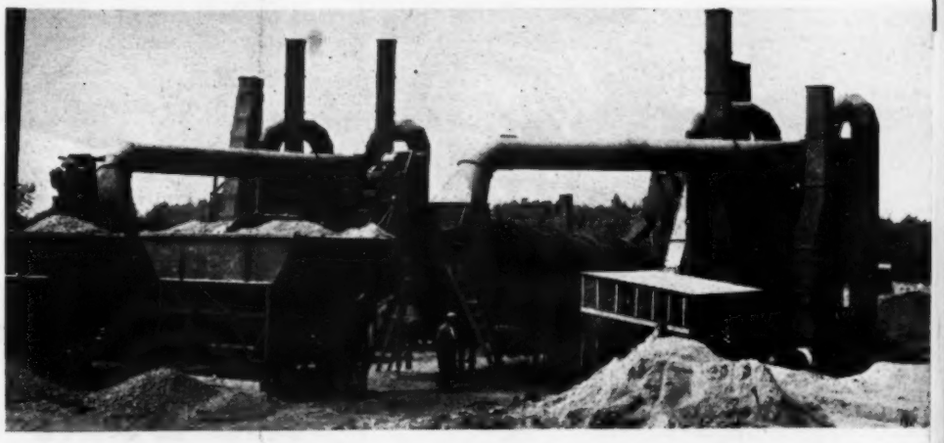
W. W. Wyman, Shelburne Falls, Mass. (under Lane)—bridges.

Samuel Aceto & Company, Portland, Me. (under Lane)—Bridges.

Calvin Baker, Houlton, Me. (under Lane)—bridges.

Gibbons & Reed, Salt Lake City, Utah (under Perini)—paving north half.

R. Heidkamp and James MacInnes, White Plaines, New York (under Perini)—seeding and sodding.

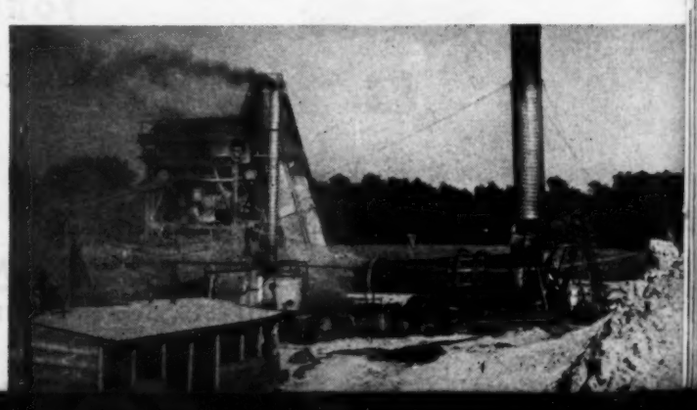


★ B. Perini & Sons' hot-mix base plant (Barber Greene)

Gibbons & Reed's Materials Plants

This contractor, acting as Perini's sub, has two plants for aggregate and hot-mix production. Photos on this page show the northermost plant, capacity 700 tons per 8 hr. shift. This plant, like the others, has operated two shifts on black base work. It comprises a portable Cedar Rapids aggregate plant, which feeds crushed materials for base via belt to a Pioneer screen and bin. The adjacent hot-mix plant is powered by a combination set-up which included two housed 240-V. diesel generator sets (International and Caterpillar) for the individual motor-driven-aggregate plant, screen, etc.; a D88,000 power unit for the dryer and D17,000 for the asphalt plant. This plant is served by imported processed material.

★ Gibbons and Reed's hot-mix equipment at their northermost or Saco plant—diesel power units shown drive dryer and mixer; generator sets in house, left foreground (right scene) supply individual motors for aggregate equipment farther to the left of this scene



"BACKBONE" the Basis of Ford Engine ENDURANCE!

Precision! Ford bearings, being precision-dimensioned inside and outside, are quickly replaceable without removing the crankshaft. The steel-backed bearing liners of special Ford anti-friction alloy slip easily into place without need for further fitting.

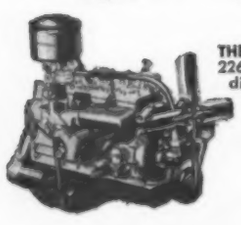
Ford The massive crankshaft pictured is where stand-up stamina starts in one of the most famous engines ever designed—the Ford V-8.

It's a remarkable example of engineering—a simple, uniform-grained *casting* of special Ford alloy steel. It weighs 69.2 pounds. Its six heavy counterweights are integral parts of it; thus they lend added strength as well as balance. Its generous main and connecting rod journal areas are precision-ground to an accuracy of within a thousandth of an inch. Each shaft is heat-treated for hardness and toughness and individually balanced to within 0.2 ounce-inch statically and 0.3 ounce-inch dynamically. Its shortness (only 26.03 inches) and its massive design give it vast resistance to bending strains and torsional vibration.

Crankshafts of the 4-cylinder and 6-cylinder Ford engines are of the same superior material, designed and machined in similar manner, to the same precision standards.

It's engineering excellence such as this, through and through, that's responsible for the time-proved endurance of Ford engines. It makes them a valued asset in any engine-powered equipment. Write for detailed data.

THE 40-H.P. FOUR
119.5 cubic inches displacement



THE 90-H.P. SIX
226 cubic inches displacement

THE 100-H.P. V-8
239 cubic inches displacement

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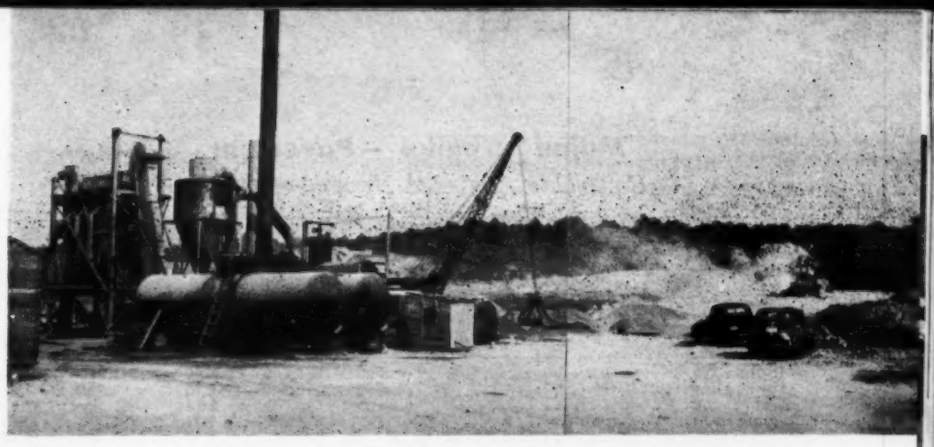
YOUR JOB IS WELL-POWERED WHEN IT'S FORD-POWERED

★ Williams B. Getchell, Jr., executive director of the Turnpike Authority (right), talking with Louis Capone, Perini's supt., while inspecting aggregate production



★ Perini's hot-mix plant (Cedar Rapids) setup in conjunction with surface aggregate plant seen in background

Construction Has Moved Along Fast

While no records have been set, construction on the Turnpike has progressed rapidly and the project is slightly ahead of schedule, being due for virtual completion this year.

Clearing, grubbing, grading and drainage were advertised in four parcels early in 1946. The two northern sections, comprising roughly half the job, went to Lane Construction Co., Meriden, Conn.; the two southern sections to Savin Construction Corporation of E. Hartford, Conn. the combined job involving relatively heavy clearing and grubbing; 4,000,000 cu. yd. of common, 310,000 cu. yd. of rock removal; 1,200,000 cu.-yd.-½ mi. of overhaul (see tabulation). These contractors moved in with modern equipment and nearly completed their work during the 1946 season. This $4,200,000 phase was handled largely by routine methods using all kinds of modern equipment, the two outfits reaching a peak monthly production of 840,000 cu. yd. in October last year.

Three-fourths of the 43 bridges were completed or under construction by late May, 1947. Ellis C. Snodgrass, of Portland, Maine, who took the two largest stream crossings (Saco and York rivers) for $1,103,000, was supplied with ready-mix by Cook & Company of Portland. Lane Construction Co., under a $3,092,000 contract for the remaining structures, installed two batching plants at strategic points but sublet several jobs to W. W. Wyman of Shelburne Falls, Mass., and to Landers & Griffin of Portsmouth. Steel shipments for decks began mid-summer.

Perhaps the greatest interest centers at the moment in the paving, the entire 48 miles having been awarded last November to B. Perini & Sons, Inc., of Framingham, Mass., whose low bids for two parcels totaled about $5,500,000.

Perini's paving operations got the flag late in May and over 250,000 tons of hot-mix had been placed by August 16 using eight mechanical spreaders, and undertaking of the entire project by a single outfit has demonstrated

★ Perini gave his new Grade-all a good workout—here seen finegrading shoulder slopes by neat spreading of topsoil

★ Gibbons and Reed used this welding cart on the Turnpike

★ Mechanical post hole auger employed in setting posts for the extensive footage of wire right-of-way fence

Maine Turnpike — Pavement

(Contracts Awarded November, 1946)

Item No.	Contractors: Description	Unit	B. Perini & Sons, Inc. Framingham, Mass. South Half—Sta. 3 to 1203 Quantity	Unit Price	B. Perini & Sons, Inc. Framingham, Mass. North Half—Sta. 1203 to 2303 Quantity	Unit Price
1	Asph. Con. Base	Tons	256,700	$ 5.40	244,300	$ 5.40
2	Asph. Conc. Surf. Crse.	Tons	73,300	7.65	69,800	7.65
3	8-in. P.C.C. Pave.	Sq. yd.	694,000	2.75	661,200	2.75
4	Wire Fabric Reinf.	Sq. yd.	694,000	0.19	661,200	0.20
5	Doweled Exp. Jts.	L. F.	7,500	0.60	7,500	0.60
6	12-in. P.C.C. Bridge End Slab	Sq. yd.	900	8.40	250	8.40
7	Gravel Shoulders	Cu. yd.	57,000	1.90	63,000	1.98
8	Cutback Asphalt	Gal.	211,000	0.14	227,000	0.14
9	Cover Aggregate	Tons	5,300	5.90	5,700	5.90
10	Cr. Stone Base Course	Cu. yd.	860	9.50	900	9.50
11	Bit. Mac. Surf. Course	Cu. yd.	300	10.25	300	10.25
12	Emulsified Asphalt	Gal.	12,200	0.14	11,500	0.14
13	Surf. Tr. Gr. Course	Cu. yd.	5,300	7.50	4,300	7.50
14	Tar	Gal.	38,000	0.15	31,000	0.15
15	Common Exca.	Cu. yd.	5,000	1.50	5,000	1.50
16	Loan Borrow	Cu. yd.	88,000	1.45	83,000	1.30
17	Excavation for St.	Cu. yd.	17,000	2.00	15,000	1.70
18	Rock Excavation	Cu. yds.	750	6.00	750	6.00
19	Class 30 Concrete	Cu. yds.	750	32.50	1,200	32.50
20	Reinforcing Steel	Lbs.	7,500	0.07	5,000	0.07
21	Miscellaneous Metal	Lbs.	27,500	0.16	30,000	0.16
22	12-in. Conc. Sewer Pipe	L. F.	23,000	2.05	19,000	2.05
23	Right of Way Fence	L. F.	182,200	0.48	184,600	0.48
24	Steel Beam Gd. Rail	L. F.	42,500	1.90	32,500	1.90
25	Wood Guard Rail	L. F.	42,500	1.56	32,500	1.56
26	Plank Curb	L. F.	45,000	0.60	31,000	0.60
27	Plank Sluice	L. F.	1,000	3.85	750	3.85
28	Metal Sluice	L. F.	4,500	2.56	2,500	2.56
29	Stone Riprap	Cu. yd.	750	6.00	500	6.00
30	Concrete Curb	L. F.	22,500	1.57	6,500	1.57
31	Field Stone Curb	L. F.	22,500	1.10	6,500	1.10
32	Stone Cutter	Sq. yd.	200	3.90	500	3.90
33	Ditch Check	Each	800	48.80	500	48.80
34	Seeding	Sq. yd.	660,000	0.07	647,000	0.07
35	Sodding	Sq. yd.	33,800	1.15	31,200	1.15
36	Monuments	Each	375	8.40	375	8.40
	Total without Items 1 and 2		$2,999,474.00		$2,785,895.50	
	Total without Items 3, 4 and 5		$2,901,539.00		$2,684,045.50	

several advantages. Foremost is the fact that this large job enabled the contractor to start out with practically an entire new outfit of modern pavers and plant equipment. The fast, reliable performance of the latest crushing, screening and asphalt mixing equipment is in notable contrast with the old worn-out equipment which handicapped contractors during the war. The Perini firm sublet the north half of the paving, including aggregate and hot-mix production, to Gibbons & Reed, which hails from Salt Lake City, of all places. Perini and the subcontractor each have two plants, one each for base and surfacing. Each firm also has operated four mechanical finishers with tandem 3-wheel 16-ton rollers.

Some of the details of equipment and construction procedure are shown in the accompanying photos and captions. Of note are the steps the paving contractor has had to take in modifying the rough grade. The road was rough graded to a width of 74 ft., with a 11-in. crown to assure drainage. Fig. 4 shows the blade cuts and filling required along the median and the shoulders.

L. D. Brown has acted as project engineer for the consulting engineers.

Grading Contract Details — Maine Turnpike

(Contracts Awarded May 2, 1946)

Item	Contractor: Description	Unit	Savin Construction Corp., East Hartford, Conn. —Contract 2— Quantity	Unit Price	—Contract 3— Quantity	Unit Price	Lane Construction Corp., Meriden, Conn. —Contract 4— Quantity	Unit Price	—Contract 5— Quantity	Unit Price
1	Medium Clearing	Acre	50	$200.00	90	$200.00	150	$ 50.00	50	$ 50.00
2	Heavy Clearing	Acre	330	150.00	260	150.00	160	125.00	140	100.00
3	Grubbing	Acre	330	150.00	260	150.00	160	200.00	140	100.00
4	Common Excavation	Cu. yds.	900,000	0.55	1,150,000	0.55	1,200,000	0.46	800,000	0.45
5	Rock Excavation	Cu. yds.	150,000	2.00	110,000	2.00	40,000	2.00	10,000	1.25
6	Muck Excavation	Cu. yds.	10,000	0.50	10,000	0.50	10,000	0.50	10,000	0.50
7	Excavation for Struct.	Cu. yds.	3,000	4.00	4,000	4.00	6,000	2.50	4,000	2.50
8	Overhaul	c.y.-½m.	300,000	0.05	400,000	0.05	300,000	0.08	200,000	0.08
9	Compacting Embankments	Cu. yds.	750,000	0.10	920,000	0.10	830,000	0.14	600,000	0.14
10	Comp. Emb. by Saturation	Cu. yds.	100,000	0.10	100,000	0.10	100,000	0.14	70,000	0.14
11	Compacting in Cuts	Cu. yds.	55,000	0.20	55,000	0.20	60,000	0.10	50,000	0.10
12	Compacting Base Course	Cu. yds.	350,000	0.15	320,000	0.15	360,000	0.12	320,000	0.12
13	Base Outlets	Cu. yds.	1,000	3.00	1,000	3.00	1,000	4.50	1,000	4.50
14	Porous Backfill	Cu. yds.	100	4.00	150	4.00	100	4.50	100	4.50
15	Concrete	Cu. yds.	1,020	27.00	870	27.00	1,930	27.00	970	27.00
16	Concrete Protection	Cu. yds.	100	5.00	100	5.00	200	4.00	100	4.00
17	Reinforcing Steel	Pounds	129,000	0.08	118,000	0.08	270,000	0.07	147,000	0.07
18	Miscellaneous Metal	Pounds	4,000	0.20	4,500	0.20	5,000	0.25	4,000	0.25
19	12" Std. Strength Pipe	Lin. ft.	300	1.65	300	1.65	300	1.75	300	1.75
20	12" Extra Strength Pipe	Lin. ft.	100	1.80	100	1.80	100	2.00	100	2.00
21	15" Std. Strength Pipe	Lin. ft.	300	2.00	300	2.00	300	2.25	300	2.25
22	15" Extra Strength Pipe	Lin. ft.	100	2.20	100	2.20	100	2.40	100	2.40
23	18" Std. Strength Pipe	Lin. ft.	3,800	2.70	2,360	2.70	850	2.75	2,100	2.75
24	18" Extra Strength Pipe	Lin. ft.	200	3.00	750	3.00	1,560	3.00	200	3.00
25	24" Std. Strength Pipe	Lin. ft.	450	4.00	1,460	4.00	1,860	4.00	600	4.00
26	24" Extra Strength Pipe	Lin. ft.	130	4.30	1,020	4.30	440	4.50	150	4.50
27	30" Std. Strength Pipe	Lin. ft.	50	5.40	380	5.40	1,470	5.50	300	5.50
28	30" Extra Strength Pipe	Lin. ft.	50	5.50	170	5.50	440	6.00	100	6.00
29	36" Std. Strength Pipe	Lin. ft.	200	6.50	240	6.50	1,210	7.00	1,100	7.00
30	36" Extra Strength Pipe	Lin. ft.	70	7.00	300	7.00	230	7.50	200	7.50
31	42" Std. Strength Pipe	Lin. ft.	50	10.00	50	10.00	50	9.00	50	9.00
32	42" Extra Strength Pipe	Lin. ft.	50	10.50	50	10.50	50	9.50	50	9.50
33	48" Std. Strength Pipe	Lin. ft.	300	12.00	100	12.00	1,100	11.50	350	11.50
34	48" Extra Strength Pipe	Lin. ft.	150	13.00	140	13.00	50	12.50	100	12.50
35	54" Std. Strength Pipe	Lin. ft.	60	15.00	50	15.00	400	15.00	50	15.00
36	54" Extra Strength Pipe	Lin. ft.	350	16.00	460	16.00	50	16.00	50	16.00
37	Underdrain—Type A	Lin. ft.	7,000	1.00	7,000	1.00	7,000	1.25	6,000	1.25
38	Underdrain—Type B	Lin. ft.	7,000	1.50	7,000	1.50	7,000	2.00	6,000	2.00
39	Underdrain—Type C	Lin. ft.	1,000	1.60	1,000	1.60	1,000	2.00	1,000	2.00
40	Underdrain Outlets	Lin. ft.	100	2.00	100	2.00	100	1.00	100	1.00
41	Stone Riprap	Cu. yds.	1,100	4.00	1,400	4.00	1,900	6.00	1,100	6.00
42	Barricades	Each	20	100.00	15	100.00	22	300.00	8	300.00
43	Dry Rubble Masonry	Cu. yds.	30	20.00	30	20.00	30	20.00	30	20.00
44	Right-of-Way Fence	Lin. ft.	33,000	0.35	30,000	0.35	33,000	0.35	22,000	0.35
	TOTALS		$1,195,034.00		$1,265,075.00		$1,108,507.50		$683,220.00	

"Egg" Roller . . .

cuts cost of asphalt paved ditch

How Washington State Contractor shaped, compacted and shot 5-mile roadside ditch with special equipment

By R. L. Winton

OUT in the Seattle suburb of Bellevue the Washington Asphalt Company recently formed, rolled and paved a special roadside gutter, using the methods pictured here. Faced with completing a 5-mile paving contract, including drainage at a specified lump sum, the company reportedly saved an estimated $2.00 per lineal foot over conventional gutter design and constructed by the means shown. The actual cost was around $0.25 per ft.

Since a curb and gutter type of construction was out of the question, the contractor decided upon a drainage ditch surfaced with asphaltic concrete. Ditch specifications agreed upon called for applying 0.6 gals. MC-5, a 30-lb. pea gravel cover, rolling, then adding 0.6 of RC-5 plus 20 lb. cover and again rolling, to form a 1-in. mat. The roadway was then to be surfaced with 2-in. of asphaltic concrete.

Richard Jackson and M. J. Plummer, superintendent and foreman, designed for this task an "egg" roller and a special type of blade or scoop. George Egelkrout, another employee of the contractor, designed a spreader box. All of this equipment provides another use for standard equipment, and can be attached to it. The specially designed pieces were made at Washington Asphalt Company shop.

Ditch Cut by Template

In order to make a depression deep enough to carry water, and do it on a scale to keep costs down, Jackson and Plummer designed a template for the blade to be made to the exact dimensions of the ditch and shoulder. The roller was then made of the same dimensions as the template. The "egg" is constructed of rolled steel, and in addition to the fact that it can extend to the side and reach the ditch, it was made easy to handle. From a valve on the side, the roller may be filled with water for either heavy

(*Continued on page* 124)

★ Roller is equipped with a valve through which water can be added to regulate its weight, or drained for ease in handling

★ Spraying oil, with part of bar working

★ View of roadbed showing drainage ditch under construction at the Vue Crest Development, Bellevue, Washington, May 26, '47

★ Special gravel spreader for ditch work. Flow of gravel is controlled by regulating shutter in bottom homemade spreader box

EDITORIAL

★ Toll Roads—Are They Ever Justified?

A TOLL road is being built in Maine. Another is set up in Oklahoma. New Hampshire plans one. Still others are under consideration.

Let us look at both sides for a moment.

First the "agin." These projects represent a policy retrogression. In principle they are not good from any standpoint except the one of expediency, and the whole nation as well as those with a special stake in wise and orderly road development are indebted to Commissioner MacDonald and to Joseph Barnett of PRA for their penetrating analysis of the toll road idea (this issue).

Everyone Loses

The facts as outlined by PRA seem to indicate that everyone will lose on a toll road in most cases today. The bond-holders underwrite a poor risk, and will stand to lose unless bailed out by public funds, in which case Mr. John Q. is the loser. The state highway program is penalized. The motorists and truckers get a road that costs too much yet falls short of full public service.

Engineers who are consultants on such projects should, in full discharge of their professional function, be given the responsibility of analyzing the economic feasibility and making recommendation as to the project's justification. Careful route selection, safe modern geometric design, sound methods of soil exploration and analysis, and rational subgrade, base and pavement design will, of course, go far to assure a durable physical highway plant and prevent excessive maintenance expense. But the economic planning calls for a higher order of professional ability than the somewhat routine engineering that follows. And this planning must be done free of promotional incentive.

While highway leaders in the main agree that toll roads are a threatening cancer on orderly national highway progress, any fair discussion will give ear to the other side. And there are several plausible arguments.

One is that there may be exceptional circumstances (political, financial or other) which make a toll road the only immediate way to meet a serious need. But cannot the same bold leadership that is required to put over a toll project be used to foster sounder legislation within the state highway frame-work?

Another is the situation wherein a state must finance a road largely for out-of-state motorists and truckers to use as a "bridge." New Hampshire's 18-mile stretch of U.S. 1 is an example. Or U.S. 66 across the Texas panhandle. The Philadelphia-New York route, likewise, is improved by New Jersey but hauls huge throngs who spend hardly a nickel while crossing the state. In theory toll gates might help correct such inequities.

Daring and Initiative

Thirdly a real point: Toll roads are an example of the daring and imagination and initiative that have made America great. Most of our early automobile highways were pioneered by emotional zealots whose chamber of commerce spirit carried us into the time when the cold facts of the planners could take over. For that matter, why must a toll road be condemned because it might not be a gilt-edged financial risk, when the great majority of our arterial mileage throughout the United States has been improved without an iron-clad estimate or balance sheet of construction cost vs. financial return? Many highway projects today are frankly a subsidy for others that will not earn their way through gas tax collections on their traffic streams. This kind of evaluation and bookkeeping is only beginning to come into its own after more than a decade of effort.

Maybe some day there'll be a slide rule answer for everything. But meanwhile, thousands thrill at the bold undertaking of such a project as the Maine Turnpike and wish it well.

Just when can we say that a project is or isn't 100% successful, anyway? Who can estimate the worth to the American people of the Pennsylvania Turnpike as an example of modern expressway design? It built fires in the imagination at a time when some conservative eastern state highway bureaucracies needed to witness such a rekindling. If even one metropolitan city gets going a year sooner on similar urban expressways as a result of stimulus of this spectacular 160-mile-long laboratory, it has become a pearl without price.

So, although we side against toll roads as a policy, the toll road idea isn't all villain. Its revival has helped focus on the basic need to get on faster with road development. Let us compromise by saying that its financially sound use here and there is OK *if* it doesn't disturb or hinder state highway programs generally. But toll gates should be a last resort.

Keep Programs Intact

Let's keep our state road programs unified and whole wherever possible. Let's keep on building roads for all the people. And let's keep on trying to solve local highway financing needs by the kind of relatively painless universal user taxes (vehicle and gas) that have worked so well to date.

★ Public Relations to the Fore

All agencies interested in highway promotion have come to realize more and more that highway programs must be sold as well as planned and engineered. Everyone in road work should read carefully the timely remarks which Hal Hale of AASHO addressed recently to the Western Highway officials (summarized elsewhere in this issue).

Highway revenues have piled up in many states due to war curtailment.

Along with other state funds, these seemingly "fat" pokes, even though fast melting, represent a terrific temptation to politicians. There's real danger in some states that road funds will be raided. It's human nature.

That is simply one of the many "angles" that must be watched in connection with long-range highway development—and one of the more immediate reasons why it has become imperative to foster an enlightened public in regard to highway matters. For years now the highway departments have been kicked around increasingly by legislatures. Politics has played a larger and larger role in a job that ought to be, as nearly as possible, a 100% engineering job. Highway engineers will be let alone to do a 100% job—and be given the green light on soundly thought out plans—only if the people back home in legislative districts have been told the whole story over and over again.

But ordinary folks can't possibly understand complex highway matters, you may say.

We don't believe that. Don't underrate your neighbors!

In California recently a wonderful job was done in disseminating road facts in clear, understandable form. Public sentiment there plus an informed legislature resulted in passage of a 175-million-a-year state road revenue program this June (see July R. & S.).

Currently in New York state the newspapers are carrying hundreds of columns of stories on highway projects. Always before the public is the need for getting on with the state's 200 million dollar freeway program.

New Jersey also is doing quite a public relations job. So are certain other states.

When it's dished out right, the man on the street will eat it up because he's interested in road progress as much as you are.

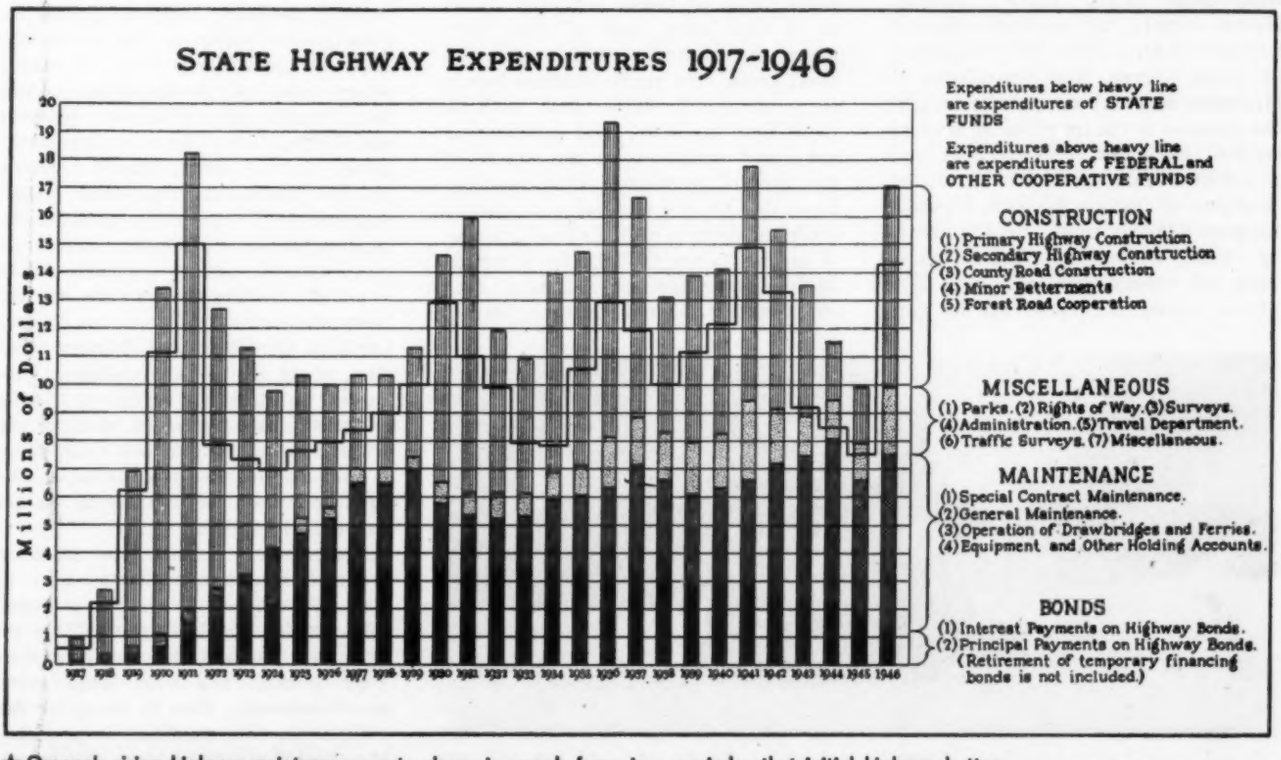
As an excellent resumé in August 15 *U. S. News* put it, there's a road building boom ahead—a twenty-*billion* dollar program that will accelerate as inflated costs adjust themselves. Where will your state be in the picture? Even more markedly than in the past, weakly governed states will lag and the progressive states with real leadership will forge far ahead in road development.

A top-flight administrator in the state highway engineer's chair will see that an equally top-flight specialist in public relations is installed as an adjutant to his department, and given bulls-eye objectives, an ample budget and the full cooperation of the highway department staff. This kind of work is still in its infancy. The men who have the full vision and the special training and experience to do the job up brown are still few and far between. Your state may need special legislation to make it possible. Certainly your governor will have to be steamed up if he isn't already. Here's a chance to pioneer.

★ Maintenance Job Growing

Two state highway leaders, Greer of Texas and Baldock of Oregon, have had special conversation with us recently over the importance of maintenance in the highway program. We all know the upkeep job is growing. But nothing has visualized its steady rise so graphically as the accompanying chart, taken from the Oregon highway commission 1945-46 biennial report. Notice how the dark grey part of the yearly columns gradually expands. Maintenance in that state—and Oregon is merely typical—has increased from a negligible item to one taking a third of all available road funds. It's like the fat guy who eats and eats and gradually crowds the other fellows off the bench.

The picture isn't all bad, of course. Mr. Baldock has a theory, we recall, namely that once you get a good base on a road you can go on maintaining the surface in perpetuity for a given traffic weight and density. The road thus will serve until functional obsolescence taps it on the shoulder and says, "Bud, you've had your day."



★ Oregon's rising highway maintenance costs, shown in graph form, is a reminder that initial highway betterments of other decades have grown old, aided by war-time traffic. In Oregon's case, increased logging over the highways has been a contributing factor

FALL AND WINTER PROBLEMS

ICE CONTROL

Problem and Remedy in Michigan

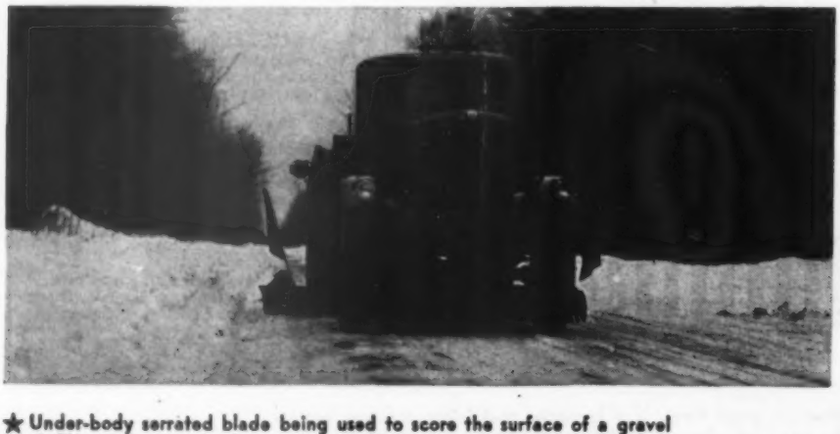
Keeping roads open in winter is a self-liquidating expense. This article, from a paper at the ARBA Convention last winter, describes the principal types of ice control problems and the best procedure for each as worked out by experience in Michigan

By B. R. Downey

Maintenance Engineer
Michigan State Highway Department,
Lansing

ABOUT three-fourths of the area of the U. S. has an average of 100 days a year during which the temperature falls below freezing. Hence, nearly all highway departments have an ice problem in a greater or lesser degree. Our procedures in Michigan may not necessarily include the solution to the ice problem in every section. Michigan, however, does have a peculiar relationship to most ice problems in that we have three rather distinct climatic zones. In the southern part, winter maintenance problems are mostly with ice; about 75% of the money here goes for ice control, 25% on snow removal and snow fence. In the central portion the division is about 50-50; in the extreme northern zone, about 65% on snow removal, 10% on snow fence, 25% on ice control.

Closely paralleling these zones, traffic conditions may be divided much in the same way. By far the heaviest commercial or heavy trucking traffic is in the lower part of the state where ice control problems are the most acute. The traffic volumes lessen as we go north. With these variable conditions in mind, and considering the great variations in the nature of ice control problems which develop from day to day and vary so greatly with the nature of individual storms, it is easy to see that, before attempting to solve any ice situation, each organization should first decide its own particular ice policy, appropriate to traffic involved and funds available. In Michigan we fully believe that our winter maintenance is financed largely by increased revenues made available by the increased winter traffic.



★ Under-body serrated blade being used to score the surface of a gravel road. This equipment is also used in Michigan to score thick ice or frozen slush on pavement, in order to concentrate chemicals on the road

Removing Packed Snow

Probably the most universal ice control problem results primarily from packed snow on the pavement. This is particularly true in states where underbody truck blades are not used in connection with snow removal operations. Snow plows on shoes will always leave a small deposit of snow on the pavement. This snow, when dry and cold, creates no particularly serious problem. However, as soon as rising temperatures or traffic loads start to turn the snow to ice, we are then confronted with an ice control problem. Obviously, the simplest solution would be to use equipment designed to take all or most of the snow off the pavement during the snow removal operations. However, if this cannot be accomplished, the condition must be dealt with as an ice control problem.

Second most common ice condition occurs when temperatures drop to just below freezing during a heavy mist or fog or light rain. Thin ice films are formed on the pavement very quickly, and over large areas simultaneously. Due to its quick development, this condition is probably the most hazardous from the standpoint of serious accidents.

The third type of problem occurs

when wet snow turns to rain, and, either due to atmospheric temperatures or to low temperatures in the pavement or roadbed, a comparatively thick layer of ice is produced. This development is slower than in the case of the sleet or thin ice condition, and is somewhat easier to cope with due to the less critical time element involved.

Key: Progressive Treatment

What should be done about correcting any of these conditions when they occur on our highways? It would seem that the whole procedure, whether occasions are frequent or infrequent, is one of progressive treatment. To properly explain the various progressive phases involved in ice control measures, it might be well to go back a few years when ice control measures consisted almost entirely of a little sand spread on the hills and curves and intersections of main routes, and maybe a few other dangerous situations known to local maintenance men. This was our practice in Michigan in 1934, when the highway department did its first complete sanding operations on selected trunk lines. It was tried first experimentally on the Detroit-Chicago route, and the reaction of the public, particularly commercial truckers, was so favorable that it was decided to extend the practice of straight-away sanding to most of our trunk line system.

This, then, was the first step taken beyond minimum safety measures at hills and curves, etc. With this extension we also started to develop mechanical means of spreading sand. In early days sand was spread almost entirely by hand, but it was soon found that satisfactory sanding precluded hand methods, and that some mechanical means of spreading sand uniformly was absolutely necessary for the economical use of the material and to obtain even coverage, as well as to speed the operation.

We estimate roughly that sand placed on the road, including chemicals and all other expenses, costs us about $5.00 a cu. yd. Normal hand spreading would involve approximately 3 cu. yd. of sand per mile for complete coverage. Hence, a saving of 1 yard of sand per mile would save $5 a mile, and would extend the distance covered by 1 truck load of sand by one-third. This is extremely important in connection with the vital time element involved in ice control operations.

"Excess" Chlorides Added

The next development in our ice control methods consisted of the addition of what might be termed excess quantities of chloride salts in the abrasives. The purpose of these additional quantities added just prior to spreading is not particularly to further imbed the abrasives in the ice, but is aimed toward the partial or complete removal of the ice from the highway surface. The abrasive forms an immediate layer of non-skid material and takes care of the immediate ice hazard, whereas the additional chloride salts starts the process of ice removal in its first stages.

★ Mechanical spreader of type used in Michigan for putting down abrasive or chloride

The final phase in Michigan today consists of complete removal of ice from state trunk line highways as soon as practical by application of chloride salts alone. This naturally involves some use of abrasives, but as our methods are perfected and our routines improved we are using less sand and more straight chemicals from year to year. What effect do these chloride salts have on the surface of concrete pavements? A comprehensive study by our Research Division indicates that recommended quantities of chloride salts can be used safely on concrete aged 5 years or more, or on concrete pavements, regardless of age, constructed with air entrained cement.

In progressing from the first to the latest phase, we have increased the importance of controlled spreading. Chloride salts are comparatively expensive materials, and we must therefore use the most efficient and economical means of applying without waste. Definitely, all spreading of straight chloride salts should be done by mechanical spreaders, and it is my opinion that there is room for a great deal of improvement in our present mechanical spreading equipment.

Present Michigan Policy

Having outlined the various phases, it now seems desirable to state our ice control policy. In our maintenance manual, "Standard Procedure for Highway Maintenance," under the heading of "Ice Control" we state: "It is the policy of the State Highway Department to keep trunk lines clear of packed snow and ice insofar as available equipment and weather conditions will permit"; and further, "Ice control means the application of quick-action emergency measures to counteract slippery conditions as early as possible, these measures to be followed by the complete removal of ice from all pavements as soon as practical after skid control has been established."

Obviously, we have secondary trunk lines in Michigan where this sort of complete ice removal could not be justified by the nature or volume of traffic involved. In these cases, which are rare, we stop our operations at various points through the four phases of ice control as previously outlined.

Our manual includes instructions on the mechanics to be followed in accomplishing the aims of our policy. Under the heading of "Pre-Season Preparation," the following instructions occur.

Pre-Season Preparation

Equipment, which includes all sanders, underbody blade attachments, power loaders, power shovels, safety

FLASHING ACTION STOPS 'EM

and . . . only this **KEYSTONE** ***FLASHING LIGHT*** *provides it two ways at once!*

Protect your men—the public—and your equipment by installing Keystone Flashing Lights. Flashes 80 "STOP" warnings per minute to both front and rear. Completely visible thru swirling snow. Acts as a "lighthouse" to promote highway safety.

Keystone Flashing Lights have been used successfully for many years by countless cities, counties, townships, park and bridge commissions, state highway departments, contractors, public utilities, etc. on all types of vehicles. Write us to send you a light for inspection. Auto Gear & Parts Co., 16th St. & Hunting Park Ave., Philadelphia 40, Pa.

KEYSTONE *FLASHING* LIGHT

The "Lighthouse" of the Highway

This vibration and waterproof light can be mounted anywhere on the vehicle, and is supplied with 6½ inch red lenses lettered "STOP" or with plain red, amber or blue lenses, for 6 and 12 volt systems.

hand rails, safety lights, etc., should be inspected and put into working order prior to the first emergency.

Arrangements for the rental of extra power shovels or power loaders should be made as early as possible.

Stocks of conventional and serrate blades sufficient for the season's needs should be on hand.

Ice control abrasives should be stockpiled previous to the first storm in the fall. The abrasives may be sand, cinders, or other approved material, and should be stored at convenient locations on the road or at central locations, such as main or branch garage yards, gravel or sand pits, or other locations.

Generally, a coarse heavy sand is the best abrasive. However, availability, length of haul, pit price, etc., sometimes make other abrasives more desirable. Specification cinders, where available, are recommended as a very desirable abrasive.

Calcium chloride should be incorporated and thoroughly mixed into the abrasive used for ice control at the time the stock piles are made. Fifty lb. of calcium chloride per cubic yard is recommended. Completed stock piles should be given a light dusting of calcium chloride to prevent surface freezing.

At the time of loading onto trucks and before applying chemically treated abrasive to the road surface, additional chloride salts may be added if needed to meet existing conditions.

For the period during which ice forms on our roadways, the manual instructs our men under five routines; namely, for sleet or thin ice on paved surfaces; sleet or thin ice on gravel; thick ice or frozen slush on paved surfaces; thick ice or frozen slush on gravel; and hard packed snow on both types of road surfaces.

Sleet or Thin Ice on Pavement

When sleet or thin ice forms on paved surfaces, railroad crossings, road intersections, and dangerous horizontal and vertical curves should be treated with abrasives by advance trucks equipped with sand spreaders. According to the working conditions, and in the judgment of the local superintendent, the straight-of-ways and other remaining sections are then covered as rapidly as possible, either with straight chloride salts, at the rate of 500 to 700 lb. per mile, or abrasive material containing excess quantities of either of these chemicals. Straight chloride salts are confined to a strip 4 to 6 feet wide down the center-line. As ice melts and chemicals penetrate to the pavement, further spread of the melting action is aided by the crown. This first bare strip of pavement generally proves sufficient to prevent traffic accidents until such time as the ice can be completely removed. Whether the chemical is applied with or without abrasives, the final application is followed by complete removal of the ice with curved blades as soon as ice is loosened sufficiently. If a sleet storm is protracted or ice recurs before the final step is accomplished, it may be necessary to repeat the applications previous to final removal of the ice.

Thin Ice on Gravel

Immediately score the surface with serrate blades. In some cases this will bring enough gravel on top of the ice to control skidding. If not, apply chloride salts at a rate not to exceed 700 lb. per mile and re-score with serrate blades if necessary. Generally speaking, a final blading to get rid of thin ice on gravel roads will not be found necessary. It may be noted at this point that serrate blades have not proved very effective on thin coats of sleet or ice on pavement surfaces.

Thick Ice or Frozen Slush

If necessary, score the surface with serrate blades in order to concentrate chemicals on the road, and then apply straight chloride salts not to exceed 700 lb. per mile. Abrasive materials may be applied also if required. Blade the road surface clean with conventional curved blades as soon as the ice deposit loosens. Serrate blades are used to score the surface of the ice or packed snow in order to concentrate chemicals or abrasives on the road. It is not intended that serrate blades will be used to peel or claw hard ice. Attempts of this kind are futile and result in broken teeth. For this reason, use serrate blades with light pressure only; that is, only enough pressure to score the ice.

For gravel the procedure is the same as on paved surfaces, except that the final blading with conventional curved blades may be omitted at the superintendent's discretion.

Hard Packed Snow

Hard packed snow on paved surfaces or gravel should be treated the same as outlined under thick ice or frozen slush for the respective surfaces, if the hard packed snow cannot be removed with underbody blades or tractor graders.

While it is the general policy of the Department to maintain year-around bare road surfaces, it sometimes happens that hard packed snow can be put in very safe and satisfactory condition for traveling at low cost on secondary or low traffic trunk lines (permissible in northern lower peninsula and upper peninsula). With this type of treatment the following procedure applies:

The snow surface should be bladed smooth with conventional curved blades to remove ruts and other irregularities. Smoothed surface is immediately scored with serrate blades. Straight-line blading during the scoring is mandatory as motor vehicles have a tendency to follow the serrations. These steps are sometimes sufficient but, if not, apply chemically treated abrasives at a rate sufficient to control skidding.

While not directly concerned with the mechanics of ice control, an important final step in our service to the public in connection with winter maintenance operations is our road information routine which informs the traveling public of current road conditions. By means of scheduled telephone calls, the Lansing office obtains current road information from all of the counties in the state. This information is tabulated and summarized in the Lansing office by 9:00 o'clock each morning during the winter season. This summary is transmitted to the Michigan State Police broadcasting station, which in turn broadcasts it short-wave to all State Police posts, where the information is made available to the public,

1. The magnitude and importance of both pleasure and commercial vehicular traffic on state trunk lines; the extreme vulnerability of this traffic flow to adverse conditions; the important responsibility placed on maintenance employees; and the self-liquidating nature of ice control costs.

2. The diverse character of our ice control problems, and the progressive phases of ice control treatment which start from the primary step of sanding dangerous spots only and extend up to complete removal of ice from the entire system.

3. A statement of the winter maintenance policy of the Michigan State Highway Department, followed by a brief summary of mechanical routines employed in carrying this policy through.

Black Topping in N. Y. State

Maintenance workers of the New York State Department of Public Works will use approximately 285,000 tons of "black top" for the resurfacing of some 220 miles of state highway during 1947. Application of this material will improve riding qualities of the highways and extend their usefulness for several more years at but a fraction of the cost of reconstruction.

A Century of Wage Inflation

By Halbert P. Gillette

IN 1919 and 1920 I spent 12 months directing 12 statisticians in the gathering of data relative to war-begotten inflations during the preceding 150 years, both in America and Europe. The most important result of this research was the demonstration that the upward trend of average wages in America had been the same as that of per capita money. Second in importance was the discovery that the productivity of the average American worker had doubled every 50 years. Third, that when output per worker became double, prices of products were halved. The result of these last two factors was that average real wages (that is, wages measured in goods) had quadrupled during the century preceding World War No. 1. During that century the average hours worked weekly had decreased from 64 to 48, a decrease of one-quarter. Moreover, during that century labor-union members had never exceeded 10% of the total number of people engaged in gainful occupation. This record-breaking increase in output and real wages per worker was clearly due to our free-enterprise system and the incentives that it gave to inventors, to managers, and to their financial backers.

The first census of the number of factory workers, their wages, the cost of raw materials and the value of their annual products was the census of 1849. The average factory wage in that year was about $21 a month. Eighty years later, in 1929, the average factory wage was about $110 a month; and the real wage was more than three and a quarter what it had averaged 80 years earlier.

In 1849 the money in circulation was $12 per capita; in 1929 it was $54; and therefore, it had almost quintupled, as had the average annual income per factory worker.

According to the Bureau of Labor, the average factory wage now is about $200 a month, and the real wage is considerably higher than before the war in spite of the inflation in commodity prices.

One more fact—and a very important one—is that per capita money in circulation is now $195, or more than three and a half times what it was either just before the war on in 1929. Since average factory monthly wage rates now are scarcely double what they were in 1929, I infer that they are destined to go much higher, probably to $300 or more. This inference is based on the tendency of average wages to rise in proportion to the increase in per capita money —a tendency that has existed for more than a century.

Inflation in prices is being condemned on all sides, yet it is the normal result of currency inflation that also causes wage inflation. Nor can average prices be permanently lowered either by federal price control, or by federal threats of prosecution of "conspiring" manufacturers, or by radio lectures by the President. Prices of goods are mainly based on two factors; (1) wages paid to those who produce, transport and market the goods; and, (2) the efficiency of the workers aided by mechanical power and effective machinery. In no single decade has the annual output per factory worker increased more than 25%. Hence, it is unlikely that we shall see a notably greater increase in average worker efficiency in the next 10 years. It seems footless to expect rapid reduction in average prices—unless a severe business depression occurs. Some shortsighted writers have expressed the hope that such a depression will occur! Others belittle present prosperity because prices as well as wages are much higher than before the war. Why do they look back less than a decade when looking back ten decades would give a proper perspective? When thus viewed, every long war is seen to have led to great increases in paper money. The continued circulation of that money has raised both wages and commodity prices. Average wage rates in America have never receded very far, and then only to rebound; nor have prices declined greatly until worker efficiency has greatly increased or a business depression has thrown a large percentage of employees out of jobs.

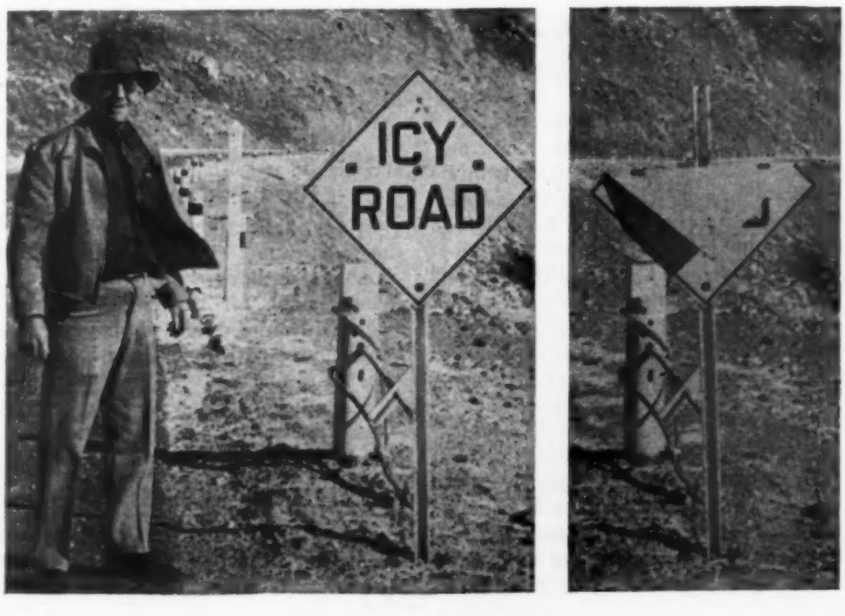
Hinged Sign Permits Seasonal Warning

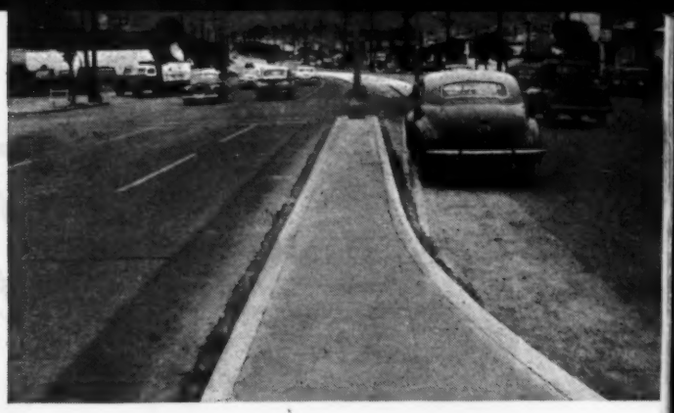
In winter it reads "Icy Roads." In summer it doesn't say anything, because the top half of the sign is folded down covering the lower half.

This bit of ingenuity pictured is the work of the maintenance staff of the Colorado state highway department, of which Douglas N. Stewart is superintendent. Shown here is assistant superintendent Charles Kemp, who with the R and S editor took a mid-winter inspection trip over one of the high pass roads west of Denver.

The hinge construction is simple. Two ordinary hardware store strap-iron hinges are sufficient, along with an inexpensive hook or catch at the top, such as you use to lock a screen door on the inside. The highway department started using this type of sign in 1946 and plans to convert all seasonal warning signs. Formerly, in line with the "cry wolf" theory, "icy road" and similar signs were hooded over in summer with cloth sacks, but hunters and kids had a tendency to swipe the sacks, so the hinge idea was substituted.

★ Now you see it, now you don't—seasonal road sign of hinged design in Colorado





★ Completed center strips as designed through the retail district of the suburb—note storage lanes for left turns at intersections. [A device which has proved overwhelmingly successful in the states and cities which have adopted it, yet for some reason not yet used systematically in other states and cities either in new design or modernization—Editor]

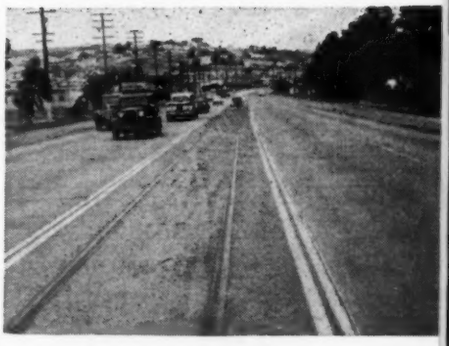
Engineering in Pictures

Big Dividends in Traffic Safety from Dividing Strips

PICTURED here is an excellent example of a type of modernization that represents a major contribution to traffic safety, yet costs relatively little. The improvement shown consists of constructing raised islands or dividing strips with curbs, along the center of an arterial that was formerly six lanes undivided.

The location is U. S. 101 Bypass through the San Francisco down-peninsula suburb of Bayshore. This arterial carries a very heavy traffic, and has had a bad accident rate, as could be expected of such a busy entrance highway threading through suburban shopping districts. It is the type of facility that ultimately must be completely redesigned as a limited access highway, with service roads, pedestrian underpasses or overhead bridges, and other accouterments. The California Division of Highways will need years to complete the many miles of such improvements programmed, but meantime is a leader in taking such steps as channelization and construction of inside storage lanes for left turns at intersections. The latter detail alone has been demonstrated as a means of decisively reducing accidents and increasing traffic capacity.

For part of the distance an abandoned electric line track provided the necessary space within the roadway width for the center strips.



★ A section of U.S. 101 Bypass before removal of old electric line tracks and construction of dividing strip and curbs

★ Curbs being constructed in trenches cut in the existing asphaltic concrete—rural section here

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Fort Smith, Arkansas, is experimenting with plastic street markers which, if successful, may save the city a substantial sum in labor and materials.

Plastic arrows and rectangles, held to the streets by hot asphalt mastic may be traveled over immediately after laying.

The markers are to be tested on brick, cement and asphalt pavements and, subject to test results, may be used on all of Fort Smith's heavily traveled streets next spring.

The Things that Add up to WIRE ROPE *Economy*

A recent survey shows that the majority of wire rope buyers consider "Easy Handling" and "Length of Service" the two most important factors in determining final rope cost.

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How Contractors Vary in Job Quality

Continues to challenge California contractors and engineers—California data given herewith

THE average roughness index of newly-built concrete pavement in California's 1946 state highway program varied from 5.5 to 13.4 in. per mile for individual projects, the state-wide average 7.4 in. compared with 14.2 in 1945. Asphaltic concrete project roughness index figures also varied widely, ranging from 12.9 to 30.01 in. per mile and averaging 20.6 in., down from 24.7 in 1945.

Average concrete 28-day strengths ranged from 2420 to 4000 psi. for individual projects; daily cubic yardage placed, from 203.9 to 763.0. On asphaltic concrete jobs, average stability of surface mix was from 34 to 47.

As recently reported by Earl Withycombe, ass't construction engineer, in "California Highways and Public Works", these figures are based on 387 miles of new pavement or surface treatment completed on state routes during the year. Some 308 miles was treatment. The index for plant-mixed bituminous surface treatment ranged from 7.7 to 34.6 in. per mile [showing that such treatment only partially succeeded in restoring high-speed riding quality.—Ed.].

Among the interesting details of this annual summary are the following:

Concrete pavement design continued to be without expansion joints. Dummy joints spaced 15 ft. were made only 1¼ in. deep, in an effort to secure maximum aggregate interlock. A considerable amount of mid-panel cracking, mostly at longitudinal tie bolts, led to increase of dummy depth to 2 in. or one-quarter the slab. Only one blow-up has occurred in 53,000 panels recently constructed without expansion joints.

Notes on Concrete Work

Nearly all the paving projects in 1946 started without the aid of trained finishers, as they were not available. As a result, considerable experimenting was resorted to by the districts to simplify finishing and improve the quality of work performed by inexperienced personnel.

One district eliminated the edging of weakened plane joints. By timely manipulation of the steel forming strips and careful withdrawal, no edging of joints was necessary. To prevent breakage of the joint edges under the cut float, the joints were poured with asphalt sealing compound prior to cutting. This practice resulted in the smoothest riding pavement of the year and none of the projects in this district exceeded 6.0 inches per mile of roughness, which is a remarkably good record.

On one entire project and on portions of another, the weakened plane joints were cut in the pavement by means of power driven diamond-studded saws. The joints formed in this manner are very pleasing in appearance and the process seems to have considerable merit. The equipment used is one that has been developed commercially within this state.

The highest average daily production was obtained on the largest paving job of the year, near Rolton; Griffith Company, Contractors, and B. Nelson, resident engineer, with J. B. Smith, street assistant; 62,183 c.y. of concrete was placed averaging 763 c.y. per day, with one double-drum mixer.

The best average strength was obtained on a contract near Fresno; M. S. Hanrahan, contractor, C. F. Oliphant, resident engineer, with F. B. England, street assistant; 28-day cylinders, 4,000 psi.

The record for riding qualities was obtained on a contract near Mossdale; M.J.B. Construction Company, Contractors, E. L. Craun, resident engineer, and F. J. Leithold, street assistant; average roughness index 5.5 in. per mile.

Asphalt Concrete Data

Side forms were used on slightly more than half of the asphalt concrete tonnage laid. Spreading and finishing were performed by machine riding side forms. The resulting riding qualities were somewhat disappointing in that they were no better than the average for the year. The knack of operating such equipment apparently has been lost, notes this summary, since the use of the type of machine that establishes its own grade has become more common.

The standards for subgrade under asphalt concrete have been materially raised. No subgrade in the 1946 program had a bearing ratio of less than 80%. They consisted of crusher-run base, cement-treated base, and portland cement concrete.

The highest average daily output of asphalt concrete was reached on a contract near Los Angeles; Griffith Company contractors, C. P. Montgomery, resident engineer, H. E. Belford, street assistant—849 tons per day. This project also holds the yearly record for riding qualities with an average of 12.9 in. roughness per mile.

Bituminous Treated Surfaces

Bituminous treated surfacing in 1946 was largely constructed by plant-mix methods, 86% being mixed through a plant and 14% mixed on the road.

The trend in plant-mixed surfacing is toward the use of heavier oils and asphalts. In many projects, paving asphalts were used to good advantage. This was made possible principally by the use of the self-propelled spreading and finishing machines that operate without side forms. The use of cutback asphalts has been practically abandoned in California due to the differential in price and to the susceptibility of the mixture to trouble from moisture.

Highway Research Board 27th Annual Meeting

The 27th annual meeting of the Highway Research Board will be held this year from December 2 through the 5th at the building of the National Academy of Sciences and National Research Council, 2101 Constitution Avenue, Washington, D. C.

It is expected that this meeting will exceed in attendance the annual meeting of the Board held in Washington last December when 700 persons registered, and 71 timely technical topics were presented and discussed at 18 separate public sessions. Thirty-nine state highway departments, 28 colleges, 3 Canadian provinces, and 13 nations other than Canada and the United States were represented.

During the week of the annual meeting the six departments of the Board —Economics, Finance and Administration; Design; Materials and Construction; Maintenance; Traffic and Operations; and Soils—will present and discuss important phases of highway technical development. Many of their 65 project committees also will meet.

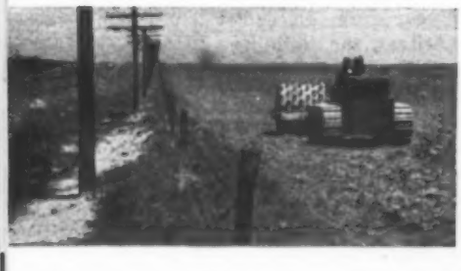
Safety Around Mixers

The zone around the paver isn't accident-free, by any means, reminds the National Safety Council, which lists 12 common causes of injury. Among these: inadequate guard for moving parts; improper location of equipment; walking or working under raised skip; trucks running into employes; etc. "Industrial Data Sheet D-Con. 7" on this subject is available to the Council's member contractors as a reprint at 15c ea. (10 or less), 10c ea. (up to 100), 5c ea. in larger quantities. Double this price for non-members. Order from National Safety Council, 20 N. Wacker, Chicago, Ill. Save your profits. Save your men.

Patching Mix Merry-Go-Round

Most bituminous patching mix made by the maintenance patrolmen for stock-piling area replacement by truck is done in straight windrows, which involves a turn-around at each end. Pullgraders and small tractors are usually employed, sometimes two or more working in tandem to do the turning over.

Here's a pair of pictures showing a circular windrow scheme, as practiced by the Arizona state highway department. This track is about 150 ft. in diameter, there's no turning around. The blading is inward, at least toward the last of the mixing. Wonder why this trick isn't seen more often.



Firebreaks Quick

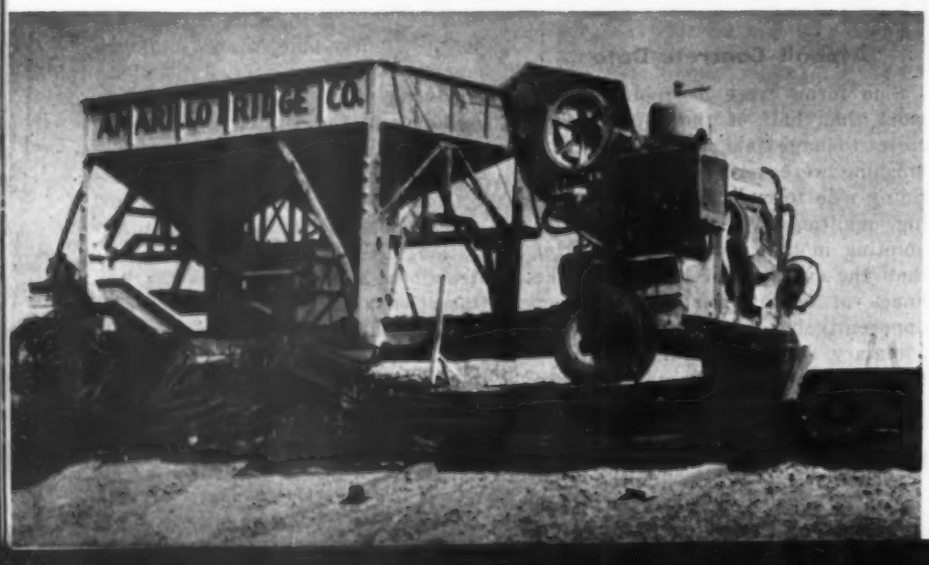
Prairie fires can't jump over the roadside strips chewed up by a combination of sheepsfoot roller and rooter plow. This combination is shown here being used by Monihan and McGuire, Wyoming contractors, along U. S. 30 west of Laramie.

Mobile Mixer-Batcher

Batching bins and weighing hopper for concrete aggregates are mounted on the same truck trailer with a modern 4-S mixer, comprising the outfit pictured. It belongs to Amarillo Bridge Company, Amarillo, Texas, and is seen here waiting a chance to do its stuff on a small bridge along U.S. 66 in the Texas Panhandle.

Four dual tires—a pair under each corner—support the not-inconsiderable dead weight. The mobility of the outfit, plus its all-in-one utility make it an ideal solution for concreting small bridges and culverts and even for occasional larger bridges.

Note that the mixer is mounted at a height convenient for filling concrete buckets or buggies or chuting, as need requires. Oh yes, aggregates are fed by skip into the mixer.



Bags of Sod Used for Ditch Dams

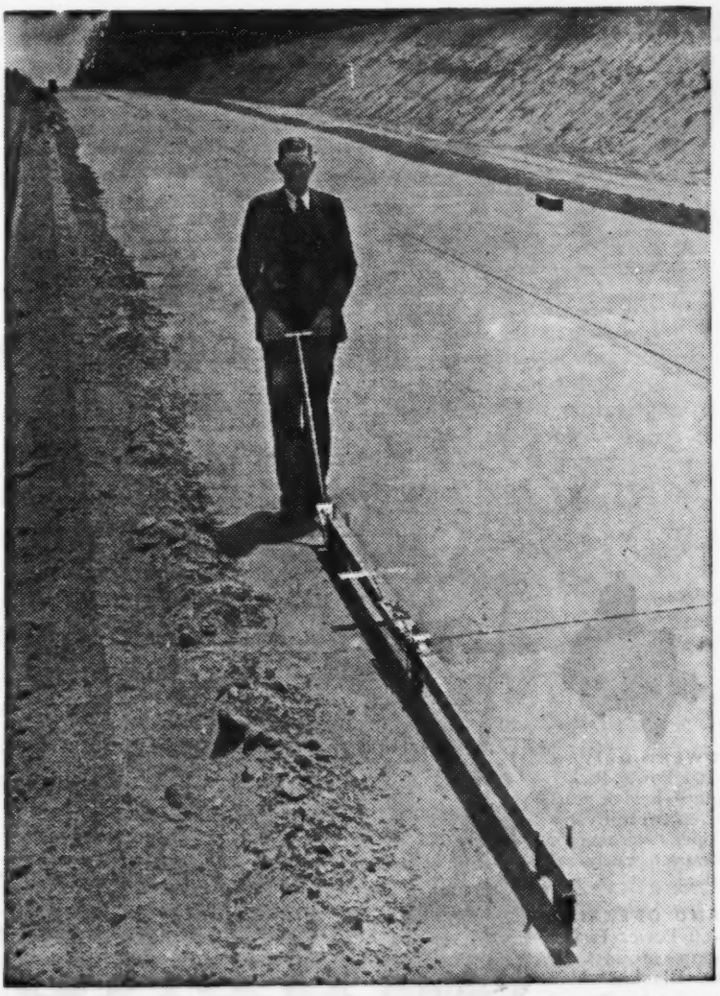
Use of gunny sacks filled with Bermuda grass sod, as the means of checking erosion in steep ditches and eventually aiding in grass development, is a trick used by the Oklahoma state highway department. As shown here, along U.S. 66 east of Oklahoma City, the crew is burying sacks in cross trenches at intervals. The earth is backfilled around the sacks, leaving their tops about flush with the ditch contour. The ditch has been previously bladed to restore its contour, eliminate corrugations and clear weeds.

Roller-Type Straight-Edge Developed in Virginia and Ohio

The Virginia State highway department is the latest to adopt and build a "roller straight edge" designed to check on the smoothness of newly finished highway surfaces. The light, portable test equipment will be used to determine whether new concrete or bituminous paving jobs meet department specifications.

Department specifications permit ⅛ in. max. variation in 10 ft. of concrete pavement or 16 ft. of bituminous surfacing. Cumbersome straightedges have been used in the past to see that new roads met these standards—but in the future an inspector will simply push the roller-straightedge down the road. A loud buzzer will sound when the pavement does not meet standards. The device will be especially valuable in checking forms, and thus is of interest to contractors.

The equipment was built by T. M. Loftis, instrument maker in the department's testing laboratory, based on Ohio Highway Department designs but with several refinements and improvements. One or more of the units will be available to each highway construction district. Ten feet long, equipped with handle, rollers, indicator and buzzer, the straight-edge is made of light metal, can easily be carried by hand and is collapsible so that it can be transported by automobile.



Highway Department photo

★ T. M. Loftis, Virginia highway department instrument maker, demonstrates buzzer-equipped "roller straight edge"

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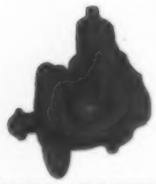

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Western

Highway Meeting Largest in Ten Years

NOT since the Denver meeting in 1937 have so many representatives of the eleven western state highway departments and the PRA attended the annual western road meeting. Some two hundred men and half that many wives were in Missoula Aug. 6-8 for the Western Association of State Highway Officials Conference, which wound up pleasantly with an all-day motor caravan to Glacier National Park via Flathead Lake and the scenic Going-to-the-Sun Highway.

Your editor will report a few of the talks and discussions in a moment. But first, let us make the observation that western highway officials are indeed a group to watch because they continue to think regionally and to unite in solving the highway problems peculiar to the West. Long range committee action, for example, will seek greater uniformity in vehicle size and weight limits between the states and a common yardstick for motor fuel and vehicle taxation.

Tom W. Holman, chairman, Washington department of highways, was elected president of the Association for the coming year, succeeding A. F. Winkler, Montana. W. C. Lefebre, Arizona, was elected vice president, E. V. Miller of Arizona continues as secretary-treasurer, and J. R. Bromley (Wyo.), James Reed (Ida.) and Mark U. Watrous (Colo.) were named to the executive committee.

Radical Changes Sought

Governor Sam C. Ford of Montana in welcoming the delegates urged elimination of state barriers to truckers, and pleaded for a federal law to distribute federal gasoline tax proceeds among the states in ratio of inter-state road mileage. He further startled the group by urging that the states not be asked to share in the cost of developing interstate routes to a level of improvement "beyond the needs of the individual western states."

Chairman A. F. Winkler in his response also touched on interstate road financing, suggesting that the basic 50-50 national Federal-aid formula be modified with respect to interstate projects, to further reduce the state's share.

Delegates to Missoula conference of WASHO discuss bridge design, load limits, other technical subjects; but greatest interest shown on broader problems of financing, programming, legislation, forest roads, public relations

Winkler also gave official note to the serious lag in forest road development, noting that forest highways not on the Federal-aid system are at present "orphans". The Agriculture and Interior departments don't seem to want the job of carrying on this work. Only 31% of the west's projected forest roads are completed, and only $9.8 million of the $75 million authorized for forest roads under the 1944 Highway Act have been appropriated to date. The need for national forest highways to aid in timber conservation, logging and lumbering is an extremely acute one, and drastic action involving additional legislation was seen to be needed.

West Ahead, Notes Hilts

While on national problems H. E. Hilts, PRA deputy commissioner from Washington, D. C., pointed out the progress made under the 1944 Highway Act in achieving a new harmony of highway purpose and procedure between states, counties, cities and the federal government. He observed that the next great national emergency, such as a war, would find the U.S. far better equipped for all-out highway transportation.

The West has advanced farther than the U.S. as a whole in programming Federal-aid projects, Texas leading the nation with ¾ of first three years' funds programmed. Western states as a group have programmed 63.1% of their federal funds, as compared with 55.6% nationally. The figures for plans approved are 43.3% and 32.2%, respectively.

Traffic densities in the West also run above the national average, noted Mr. Hilts. However, 90% of the road mileage still carries less than 2000 vehicles daily. The West leads in heavy trucking, this traffic having doubled recently as against a 50% increase nationally (however, axle loads in the west are lighter than the average). Combination truck and trailer gross loads exceed 50,000 lb. in the case of one truck in 13 in the west, as compared with 1 in 38 nationally. Correspondingly, maintenance costs on western roads have risen faster than the national average.

As to secondary Federal-aid roads, Commissioner Hilts urged states and counties to plan an integrated system before programming projects, and to put continuity of effort on land use studies.

Hal Hale of AASHO in a talk on public relations caused considerable discussion of this timely subject. Fred Grumm of California pointed out that the work of negotiating for right-of-way property is considered a public relations function in his state.

Postwar Program Status

The highway engineer shortage didn't take long to get into the discussion. W. L. Anderson said that Utah began the postwar job with only 40% of its personal needs. Mistakes were inevitably made that cost far more than the cost of more and better qualified men, showing the false economy of low engineer salary scales.

Commenting on California's work, Mr. Grumm said that 100% of his state's road funds were obligated between Oct. '45 and June '47, comprising $120,000,000 for 481 projects advertised, all but 17 let. Currently on the books are 232 contracts worth $76 million. He believed that his state has saved very large sums by getting started immediately before advancing inflation further raised bid prices.

Right-of-way problems were aired. W. C. Lefebre reported that Arizona is applying Federal-aid funds only on larger projects, thus eliminating PRA red tape in getting R-W approved on non-f.a. jobs. California has spent $37 million for right-of-way since the war, mostly in the two metropolitan areas. Land often represents 75% to 90% of the total cost of urban expressways.

The side of the contractor was presented by H. E. Foreman, managing

director, Associated General Contractors of America, Inc. He said that the time has come to step up the speed of highway construction. Hastening this job will save lives, reduce congestion, cut highway transportation costs, save maintenance now expended on worn-out surfaces. The states now have contractor capacity for this speed-up, he claimed, materials are becoming more plentiful, and construction costs have generally levelled off. Increased volume will aid contractors in their effort to combine the advantages of better labor, better equipment and better management to reduce their costs.

A recent survey of AGC highway chapters, noted Mr. Foreman, showed that in two-thirds of the states the contractors feel they can handle more work—30% to 600% more. He urged engineers to consider more closely the new concept of highways costs, which is not just in terms of so much per mile but which takes into consideration the greatly improved and refined roadway design. Vehicle capacity per lane-mile is more truly the proper yardstick.

Costs have leveled off in 22 out of 30 states reporting, and three states reported a downward trend (early summer). Only one western state reported cost trend still upward. Costs, however, are not likely to drop suddenly but may continue at an inflated level for a long time, thus making it of little value to long postpone needed highway betterments.

Engineer rather than contractor shortages represent the real bottleneck, noted Mr. Foreman, who concluded by recommending that where prices have stabilized and where contractors can take on more work with adequate competition, definite steps should be taken to accelerate lettings.

Mr. Watrous of Colorado, in comment on Mr. Foreman's talk, said that engineers are too prone to specify methods. He believed that in general only results should be specified, then leave it to the ingenuity of the construction industry to work out the methods.

Bridge Problems

Much of the second morning was devoted to bridges and traffic load restrictions. E. H. Thomas, bridge plans engineer, Montana, approached bridge design in a unique manner in a paper, "Effect of Industrial Trends on Bridge Design." Too detailed to be given in full here, the paper showed that changes in labor conditions at the site and at the fabricating plant, and in the economics and availability of materials, affect bridge design as seriously as do traffic trends. Great changes in both respects have taken place in the past two decades, and during that time bridge replacement has fallen far behind road reconstruction. Sub-standard structures, as a result, are in evidence everywhere. Designers have been remarkably far sighted as to load limits, but not as to width. For example, Montana has 1479 bridges on the Federal-aid system, of which 345 are less than 20 ft. wide but only 142 are rated at less than H15 load capacity. Widths to be safe should be not less than 22 ft. for passenger traffic or 24 ft. for mixed traffic. The goal of H15 and 24 ft. width is a minimum for the present, but what of the future? Already many H15 bridges are carrying excess loads which virtually eliminate any factor of safety.

Mr. Thomas raised the question as to the proper design for interstate highways and their high design standards. H20-S16 loading has been adopted for bridges on this system, a loading in excess of maximum legal axle loads now in force for pavements (H20-S16 a straight 33% increase over H15-S12)). The interstate system foreshadows a time when heavier-duty highways will network the nation, which in turn envisions heavier loads on all roads. Since big loads go everywhere today this whole question is indeed a serious one, and poses an immediate problem wherever H15 bridges are contemplated on ordinary roads.

Additional study is needed in determining whether it is safe to reduce over-all design loadings on heavy-duty bridges, or whether to provide for the full effect of simultaneous passage of two maximum sized vehicles having identical axle spacing—a theoretical happening that certainly will occur only rarely.

On the subject of materials and fabrication, Mr. Thomas urged that consideration be given to raising the allowable stress of structural steel, along with a tightening of control over steel quality. (Higher yield points are being achieved today by many mills). Also more standardization of member length and detailing was recommended in planning programs of steel or timber bridge replacement. More shop fabrication with less on-job labor offers yet unrealized economies.

The growing danger of girder and truss failure from fatigue under repetition of heavy loads was voiced by G. S. Paxson, bridge engineer, Oregon. Railroads have long experienced this phenomenon. Fatigue develops rapidly under repetitive stresses approaching or exceeding 100% of the design limit.

Load Limit Enforcement

Following a paper by F. L. Mathes on load-limit enforcement, discussion brought out the fact that while the western states have agreed on a uniform vehicle code, only one has adopted it. Until regulations are more uniform, little progress can be made in enforcement. Mr. Paxson of Oregon pointed out that logic is often with the truckers, who just can't see "this state-line funny business". He urged adoption of the 1946 national code, which is flexible enough to make such adoption feasible at this time. Today, added Mr. Baldock, Oregon, three-fourths of our roads are good enough for handling the larger loads permissible under a uniform national code. Why wait longer, since the time will never come when all roads are highly enough improved; meantime as in Oregon permit control can be exercised over the rest.

Fred Grumm of California noted that a principal advantage of having a uniform code in the 48 states is the united-front strength this would give against the powerful trucker lobbies. Lobby interests representing only 10% or so of California's trucks presented innumerable bills this year to get out from under or modify the present laws.

In Montana enforcement has been no trouble in the case of single axle loads, but much dissention has arisen over permissible widths of combination and intermediate axles. Police officers are extremely busy and it may be necessary to have load limits enforced by the state highway department, which has the greatest incentive to preserve the highways. In Montana a road maintenance employee has police powers, but the highway patrol cooperates and issues summons. Many violators are repeaters. The most effective weapon is not the fine but requirement that the trucker unload on the spot.

Distrbutor's Viewpoint

William A. Danner of Boston, president, Associated Equipment Distributors, outlined what machinery people are doing to speed up the road program. Most lines (shovels, cranes, excepted scrapers) are now in fairly good supply, he said. New models are already contributing to better job efficiency. Better service facilities, including more factory trained mechanics and greatly enlarged parts inventories, are being offered today by AED's 700 members, who represent some 95% of construction machinery distribution. The trend in equipment design continues toward greater utilization of large air tires, he noted;

we'll eventually see 95% of highway machinery on pneumatic tires. Highly mobile crushing plants are a recent case in point.

Among other equipment innovations noted are: vibratory compaction units (several manufacturers soon in the picture): a suction leaf gatherer to get away from the old fashioned broom, which may disappear entirely as a means of sweeping streets; larger equipment generally for road work, which will encourage larger contracts; better air and hydraulic controls for easier operation.

Mr. Danner also looked for some easing of contract prices and an increase in the labor pool. Three-fourths of distributors are now quoting firm prices, which will aid contract price stabilization.

Equipment Write-Off

A PRA spokesman who has made a study of equipment write-off practices talked on the seriousness of this matter to project owner and contractor alike. While 5% to 10% per month was considered satisfactory during the war years, owners of large industrial plants and other project work today consider this rate exorbitent. One large eastern concern has decided to buy all construction equipment and let the contractor use it. The Army's big new bomber base under way at Limestone, Maine, involves a 25% annual equipment write-off plus 8.3% annual carrying charge, which the contractor is said to consider too low although machinery repairs are also charged to the work. Much machinery while OK physically after a five-year period, may be greatly depreciated functionally, noted this speaker.

Interim Committees Urged

Continued study toward a basic formula for uniform highway financing in the various states, was recommended by the association's executive committee under Tom Holman. It also urged (1) establishment of legislative interim committees in each state for the purpose of assembling facts on highway needs, (2) improvement in state highway public relations.

A report of the western committee on uniform traffic control devices noted that while a national uniform traffic striping system has been adopted by AASHO it had many dissenting votes. Recommendations from the individual western states are still widely divergent, and backed by conflicting and sometimes amusing rationalization.

Resolutions passed by the Western association:

(1) Urged continuation of federal aid into 1949-50-51 on essentially the present basis (grade crossings excepted);

(2) Asked congress to take special steps to make the remainder of appropriated forest highway funds immediately available;

(3) Opposed U.S. House resolution 2840 which would prohibit PRA procedure of obligating federal-aid funds for the states in advance of actual appropriation;

(4) Asked that roadside landing strips be so located that planes will always clear the highway by at least 50 ft.;

(5) Recommended a study toward renumbering of the national highways;

(6) Urged speedy adoption by all states of the national uniform vehicle code.

A valuable adjunct to the WASHO convention was the round-table meeting of the Joint Cooperative Committee, AASHO and AGC. Under Harry J. Kirk, director, and W. C. Lefebre, chairman, problems of mutual interest were discussed.

Highway Engineers Must Gear Up Public Relations

Capable public relations staff, with positive program of public education, needed in each state to sell long-range highway program.

By Hal H. Hale,

Executive Secretary, American Association of State Highway Officials, Washington, D. C.

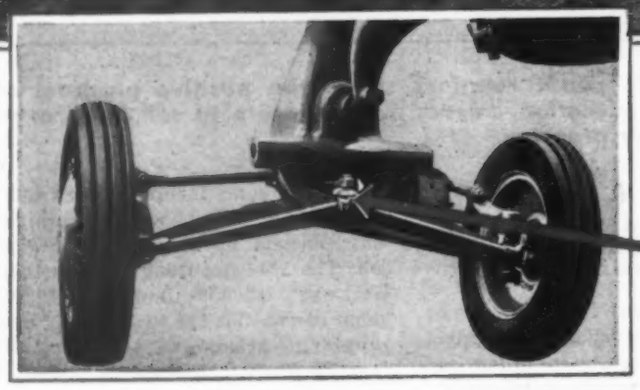
THERE is no more important work of the highway official than public relations. However, in order to have good public relations, we must ourselves want good public relations. A well organized, efficient public relations division is essential to a state highway department today. Undoubtedly, one of the first comments in the establishment of such a department will be something like this, "They are setting up a propaganda organization to perpetuate themselves in office." This is a hazard that must be met and overcome.

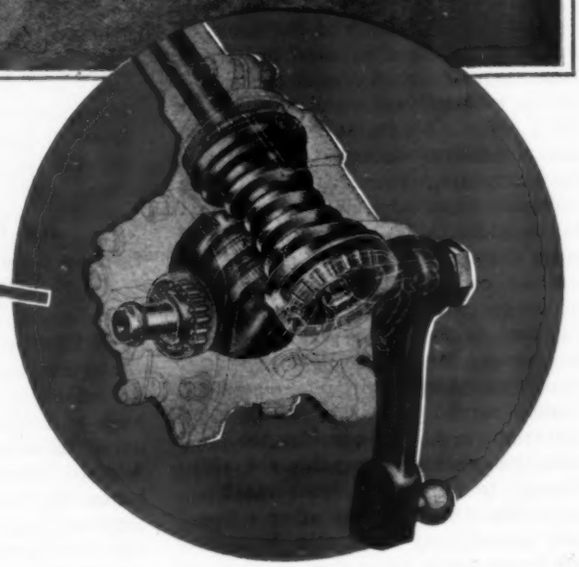
With the passage of the Federal-aid Highway Act of 1944, state highway officials were placed in a position of responsibility, the successful acceptance of which will determine the continuation of the Federal-aid highway program. It placed upon their shoulders the responsibility of a public relations operation far greater than any they had ever shouldered before. For a quarter century, in more or less degree, they have been concerned primarily with state highways. The highway system we have today, inadequate though it may be, in some instances is an indication of the success with which highway officials have carried out that job. The 1944 Act went much further. Highway officials immediately became responsible for two entirely new programs—urban and secondary, or farm-to-market. Success on either of these depends enormously upon the public relations operations of the highway department.

Excerpts from address before the 1947 *annual meeting, Western Association of State Highway Officials at Missoula, Montana.*

Some Local Hostility

In a measure, the highway officials entered a hostile field, and I use that word advisedly. Relations between cities and counties and state highway departments were not all good. These local agencies, by their very nature, do not generally conceive of road construction in the same manner as do state highway officials. Therefore, it became incumbent upon the highway official to "sell" the program to local governments before actual construction could ever take place. He must deal with city councils whose conceptions of long-range financing and design almost always differ from those of the highway officials. He must deal with the county courts and county commissioners, whose opinions in many instances differ as radically from his own as from the conception of the urban officials. Only by the selling of a sound program of intelligent use of *limited road funds* can he ever hope to carry out the mandates of the Federal-aid Highway Act of 1944.





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Efforts of highway departments in the public relations field vary widely from good to bad, to none at all. In many instances, these efforts are confined almost solely to announcements of bid lettings and contract awards, informative in themselves, but not public relations.

Positive Program Needed

Many highway officials too often find themselves in a position of defending their work weakly against unfair and unwarranted criticisms, instead of taking the aggressive position of telling their story first, forcefully and fully. Building a good system of roads, with whatever funds may be provided, is not the only responsibility of the state highway official. He must develop policies and practices in good public relations that will merit public approval and he must utilize that public relations tool to win public approval.

The public generally does not need to be told that they need good highways. They *do* need to be told of the economic benefits that result from good highways. They need to be told how much good highways will cost, how good highways must be financed, how much money is available now for such work, how it is being spent, how much road it will build and whether or not the highway user taxes they are now paying are all being used to build roads. They need—and are entitled to—a full and complete picture of highway financing in their state. The highway official cannot sit meekly by and pretend it is not his job to consider means of financing the roads he builds.

Approximately 42%, or about 45,000 miles, of our high-type roads will wear out in the next ten years. I believe that if we do the job that lies ahead, *we are probably going to have to spend, at all levels of government, something approximating four billion dollars a year.*

That is a lot of money and the public is going to have to be told by the highway officials why it is needed and how it is to be acquired, if it is to be provided.

Short-Sighted Opposition

In many instances, any increase in highway user taxes, needed to keep traffic moving on a system of good and safe roads, is being skillfully and effectively opposed by some selfish interests that refuse to consider their own total needs and long-range interests, let alone those of the public.

Toll road proponents are busy criticising the way traffic problems are being solved and they say that toll roads are the great panacea. The public relations work of these groups is convincing to the uninformed but it is certainly not altruistic. If the truth is a little bruised on occasion, the volume and vehemence of their publicity seems to compensate.

The highway departments must shift from feeble defense in this situation to a vigorous, accurate and determined attack, for to sit out this fight will be to lose it.

We are embarking on a huge construction program; entering new fields in the extremes of multiple arteries and secondary rural roads, where we encounter new problems and new segments of the public not previously met before. We must develop policies acceptable to the public and we must marshal the facts on which they are based. All of this work will be fruitless unless it is well and widely reported. Awakening and maintaining public interest and support of the highway departments' plans and programs is essential to our progress and can be attained only by the establishment of a capable public relations organization.

"Golden Harvest"?

Herewith is a table of revenues accruing to the states from highway user taxes for the year 1946. Final figures will vary somewhat from these shown, but they are pretty close to being correct.

Estimated State Highway Revenues, 1946

State Gasoline Tax (net after refunds)		$1,025,000,000+
Motor Vehicle & Motor Carrier		530,000,000
Total Highway User Revenue		1,555,000,000±
Disposition of Highway User Taxes		
Collection Costs	$ 60,000,000	
State Highways	970,000,000	
Local Roads and Streets	400,000,000	
Non-Highway	125,000,000	
		1,555,000,000±
State Highway Income (Exclu. Fed. Aid)		
Highway User Taxes	970,000,000	
Other	55,000,000	
	1,025,000,000	
State Highway Expenditures		
Maintenance	325,000,000	
Debt Service	140,000,000	
Adminis.—Equip., etc.	65,000,000	
Highway Patrol	30,000,000	
	560,000,000	
Remainder of state funds available Hwy. Const.	465,000,000	
F. A. funds paid to states	147,000,000	
Total Const. funds, 1946	612,000,000	
Total Const. expenditures, 1946	485,000,000	

(Does not include any funds carried over from 1945).

No one has told the public that $400,000,000—almost equal to the amount highway departments have for new construction—was returned to cities and the counties. Some went for road construction, some elsewhere. No one says much about the fact that $140,000,000 was for debt service. $325 million went to maintenance, $30 million for state police patrols, $125 million for "non-highway use" (diverted).

We constantly refer to 1940 and 1941 as a basis of comparison for present prices, costs and taxes. In current publicity on increases in highway department revenues, no mention is made of the fact that highway department costs have increased along with all other costs—some elements up as much as 250%. Maintenance is up 50% or more. Prices of automobiles have been increased materially. Retail gasoline price in state capitols when compared with 1941 prices is, excluding gas taxes, up 3% to 48%. The "golden harvest" simmers down in all too many instances to "share cropping."

The highway official, and the highway official alone, can and must explain these things to the people of his state. The highway official does not make the laws under which he operates. These are made by the state legislatures, answerable to the people. Until the highway official refutes misinformation or "shaded" information in an efficient, understandable, authentic manner, the people only know what others have told them.

Note that 1947 revenues total $1,555,000,000, a lot of money. Through every public relations device known, some groups are continually hammering into the public mind this "golden harvest" of highway revenue. In other words, they infer that the highway departments are rolling in wealth and it is inconceivable that any new revenues or increased taxes are either needed or justified. When you read

Excise Tax Question

There has been a concerted effort

(*Continued on page* 123)

★ Two mechanical loaders—one at each end of the block—performed most of the work of peeling up and loading old asphalt into trucks. This unit is a Hough. Traffic blockades, even partial, are costly to downtown merchants, and nowhere does the full use of modern power equipment pay out so well for everyone concerned

How to Rip Up An Old Street

—*in a Hurry!*

★ At the other end of the block a Traxcavator is seen "getting under" the 2½ to 3 in. asphalt layer

★ Into the truck she goes—at a rate equivalent to the work of a considerable gang of pick and shovel workers

★ A second and third shove to pry the stuff loose, and the scoop is filled—all in less than a minute and with one lone operator plus another man or two to throw stray chunks into the pan.

A FAR cry from WPA methods is the slam-bang procedure with which Syracuse Constructors, Inc., recently went through a downtown block of their home city. See accompanying photos and captions for some of the details of this repair and resurface job, which is one of 13 street contracts totaling 6 miles this year in Syracuse.

According to Everett E. Enos, division engineer in charge of paving for the city, some resurfaces consist of two 1½-in. sheet asphalt courses. Other projects having a good base will be given only a single 1½-in. cold-mix topping. Sheet asphalt this year has been bid at less than $3.00 and combined surface and 8-in. concrete base is costing about $5.50 per sq. yd., plus $0.50 and $1.50, respectively, for reinforcing steel and grading. Nelson A. Pitts is Syracuse Engineer.

★ (Left) Two pavement breakers powered by a Sullivan compressor took out sections of old concrete base, where necessary for base replacement or utility cuts. (Right): Twenty to 24 men supported the power equipment in this block, shown here as it looked by mid-afternoon. Hand labor could not be reduced below a certain minimum due to utility details

Beat old man Winter to the punch!

Now—before frost and snow set in—put your roads in first-class condition with TARVIA* road tar.

There's a correct grade of TARVIA road tar for every type of repair and resurfacing job. All are economical, easy to apply, extra long on service.

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D. H. D. gives you these big advantages in road building and heavy construction operations: less wear, fewer repairs, more power from a cleaner engine, and lower operating and maintenance costs. Leading engine manufacturers accept Naturalube D. H. D. as a superior lubricant.

☆ ☆ ☆

For complete information, ask your Naturalube Distributor or write direct to Lion Oil Company, El Dorado, Ark.

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If you don't believe Naturalube D. H. D. is the best oil you have ever used, Lion Oil Company will give you your money back.

Why Toll Roads

Aren't the Answer

In the following letter Thos. H. MacDonald, Commissioner of Public Roads, answers a newspaper editor's query, analysis of the feasibility of toll roads. His reply isn't good news for bond holders

Mr. Ralph M. Blagden,
Managing Editor, SUNDAY NEWS,
48 Hanover St.,
Manchester, N. H.

We are in receipt of your letter of April 8 requesting information relative to toll roads, a request which you say is inspired by the bill pending in the New Hampshire legislature to provide for the construction of a toll highway and a recent article in "The Saturday Evening Post."

The views of the Public Roads Administration on the advisability of toll financing for highways have been clearly presented on previous occasions, notably in the report entitled "Toll Roads and Free Roads," submitted at Congressional request to the 76th Congress in April, 1939.

PRA Positions Unaltered

Our views as presented in that report remain substantially unaltered. Even in particular instances in which traffic can be attracted to toll highways sufficient in volume to repay the costs of financing, construction and operation, we regard the toll device as an inadvisable and expensive expedient. So far as we know there is no existing toll road (except some short roads built to afford tourist access to mountaintops and coastal resorts (on which earnings have been sufficient to cover all costs of the undertaking. It is not generally understood that the Pennsylvania Turnpike was subsidized by a substantial PWA grant amounting to $29,250,000 of the original cost of $71,500,000.

For reasons inherent in a practicable application of the toll method of financing, no toll highway can be used by all of the traffic that would be served by a highway of identical design and location operated free of toll.

Some usage is inevitably discouraged by the heavy charge exacted in toll. How heavy that charge may be would be appreciated if it were understood that a rate of one cent a mile payable for passenger automobiles—the rate depended upon in most of the proposals—is equivalent to a gasoline tax of from 12 to 16 cents a gallon.

Another large fraction of the traffic that would use a free road, that cannot use a road of the same location and design standard operated as a toll facility, is made up of vehicles moving on trips of shorter lengths than the distances between toll gates. Entrance and exit are possible on a toll highway only at its gates. Every gate represents a substantial capital investment, and continuing large operating expense in salaries of attendants, etc. Since the best that can be hoped for in nearly all toll facility proposals is a bare possibility of financial soundness, the number of gates must be kept at a minimum, their spacing at a maximum. In some of the present proposals access points average as much as 25 miles apart. Analysis of the lengths of highway trips extending out of cities before the war in eleven representative states, including New Hampshire, showed that the number of trips less than 20 miles in length varied from a minimum of 79% to a maximum of nearly 88% of the total trips. Trips less than 10 miles varied from 56 to 70% of the total.

[New Hampshire recently enacted legislation for a toll road along its 18 miles of shore, continuing southward from the Maine Turnpike. Eight other states also passed toll road measures of some kind in 1947 before legislatures adjourned.—Editor.]

Restricts Traffic Service

It follows, then, that apart from ability or willingness of travelers to pay, no toll road can be expected to serve much of the traffic potential to a free road in the same location. And this is true even if the so-called free road is designed as a controlled-access facility, because accesses to such a facility will invariably be spaced at much shorter intervals than is financially feasible on the toll road.

So, toll roads, if they are built, should be clearly understood to be partial facilities, capable of serving only a part of the traffic requiring service in the directions in which they extend and in the areas they traverse. A substantially paralleling free road must always be maintained to serve the remainder, probably the large remainder, of the traffic.

And here enters the most serious danger of the toll road. However great may be the remainder of traffic left to the parallel free road, however insistent may be the need for substantial improvement of the facility it affords to that traffic, the design standards of the free road must be held materially lower than those of the toll road, else the latter will be robbed of nearly all of its essential support.

Moreover, to this proposition there is a corollary equally damaging to the theory of the toll expedient as an economic solution. That is, that the toll road, in order to attract a barely sustaining traffic must be designed to standards adequate for the accommodation of a traffic far greater than that which it can actually attract. The Pennsylvania Turnpike, for example, could serve with complete convenience a traffic of 12,000 vehicles a day. Its actual average is 3,000 to 4,000, the bare minimum commonly considered essential to justify a four-lane divided highway.

Only Quick Way?

But, it is asserted that resort to the toll expedient is the only way to get needed high-type facilities quickly; it is the only feasible way, it is said,

to raise the necessarily large cost. Now, of course, the places where the most expensive new facilities are needed most quickly, namely, within and in the near vicinity of cities, are the very places where it becomes utterly impracticable to employ the toll method. The Post writer tells us that, and in this instance he is right. But, still, he accepts the argument that only by tolls are desired improvements to be obtained without intolerable delay. Like all of the other arguments advanced, that, too, is fallacious. If the capacity and facility to be offered by any toll road are actually required, they can be provided in a so-called free highway more cheaply than in the toll road. Apart from the clear advantage of not having to maintain expensive toll collecting facilities, this is true. Toll roads are built with borrowed money, nearly always with money borrowed by way of what are called revenue bonds, that is, bonds predicated solely upon the problematical earnings of the roads themselves. Such bonds necessarily carry a relatively high rate of interest. If money must be borrowed to get the high-standard road *now*, it can be borrowed more cheaply (at a lower interest rate) in bonds predicated upon normal tax revenue and the faith and credit of the state at large than it can by the means commonly employed in toll road financing.

In sum, a toll road is bound to afford only a partial, and a communally unsatisfactory and expensive solution of the area's traffic.

Excessive Cost Factors

It cannot fail to afford an expensive solution because:

1. To attract any traffic at all it must be designed to standards beyond the need of the traffic it will get. This is signalized by the relatively high charges that must be exacted for its use.
2. It must always remain an added facility incapable of dispensing with the need of alternate free facilities that must be continued in service at cost to the community.
3. It must bear the large cost of toll collection.
4. It is commonly, and almost necessarily financed with revenue bonds at interest rates inevitably higher than the rates the public would have to pay for money borrowed to create an identical free facility.

It has been stated above that the standard of alternate free roads must be kept depressed for protection of the investment in a toll road. But what is going to happen if, or probably I should say when, the traffic remaining to be served by a free alternate rises in volume to the point where only high-standard improvement can provide the facility and *safety* (we are more conscious of safely requirements nowadays) it required? That thought may well give us pause. Are we then going to improve the free road to its required standards and let the consequences to the toll road be what they may? Or are we just going to "free" the toll road, that is, take over its bonds as a public obligation and suspend the toll collection? The first course would mean inevitably large loss to the toll road investors. The second would mean either some reduction of the investors' expected income, or the public assumption of a debt bearing a higher rate of interest than it would have been necessary to pay had the road been built free in the first place. Moreover, if we are tempted to choose the second alternative we will probably find that the road built as a toll road is not located properly to serve as an acceptable all-duty free highway. So what can we do?

Toll Roads vs. Bridges

To revert to the argument that the toll expedient offers the only hope of immediate needed improvement, what does that imply? It implies that at a time when public highway authorities find it difficult to obtain at reasonable cost the materials, equipment, labor, engineers and contractual services sadly needed for the correction of serious deficiencies of the public road system, competing demand for these scarcities is going to be thrown upon the market. Scarcely a wise or a sound suggestion, I would say.

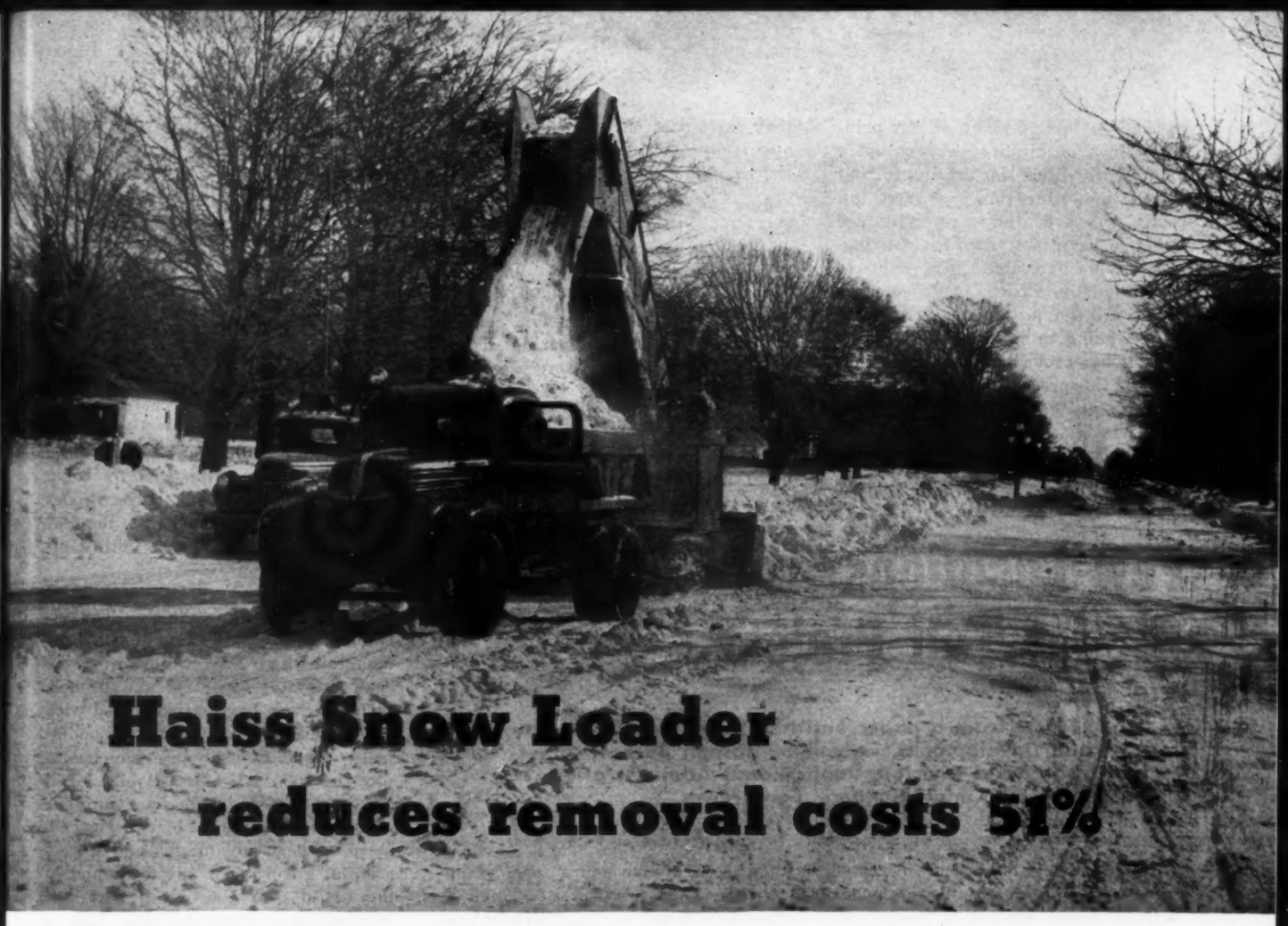
A matter of puzzlement to the author of "The Saturday Evening Post" article it seems, is the different attitudes assumed by the PRA toward toll roads and toll bridges. The rather simple explanation can be discovered without difficulty by anyone who is really looking for it. It is that a toll bridge can be, and for its financial success invariably must be a monopoly. It has no free bridge competition. Hence it exists as the complete and only facility serving a particular traffic stream. It should always be publicly owned and operated and freed when its tolls have paid for it. Under these conditions it is open mainly to the objection generally that it is built with money raised by revenue bonds, an objection which need not lie against it if, as is usually feasible, tax-predicated bonds are issued.

Right here we come upon ground fertile for the raising of toll-road propositions. The general public, which wants and truly needs modernized highway and bridge facilities, is made to appear at times to be unwilling to pay for what it wants and needs. In California, recently, after a most careful study of the highway needs of the entire state by a joint legislative committee, aided by competent advisors, plans were projected for a long-range program of general highway improvement. The plans proposed, if permitted realization would result in the meeting of all reasonably foreseeable needs of improvement of the entire state highway system, of all substantially important secondary rural roads, and of the arterial streets of cities, and, additionally, they would provide for the outright creation of a new system of high-standard expressways joining all of the state's larger cities. All of these benefits would result from an orderly program of effort, applied within a period as short as by any other means such a general improvement could be effected. For financing, a gasoline tax increase of 2 cents a gallon was proposed [1½c *as subsequently passed.—Ed.*] and some increase in motor vehicle taxes. The proposed tax increases met with most vigorous opposition from representatives of the petroleum industry and tax-affected road users. Yet, here there was the offer, not of a few stretches of highway, but of a systematic improvement of the whole network of roads and streets in accordance with need, at a cost equivalent to about 7 cents per gallon of gasoline consumed, compared with the 12- to 16-cent per gallon equivalent of practically all toll road proposals.

Gas Tax Opposition

It generally appears that opposition to gas taxes and their increase arises from the petroleum industry rather than from the consumers of gasoline who actually pay the tax. Why this should be so is something of a mystery. We have looked long and hard to find evidence, if there be any, that a gasoline tax at any level thus far reached has had the least depressive effect upon the consumption of gasoline. We have found none. The tax is the ideal substitute for, and preventive of, toll financing. It is actually a form of general toll that has none of the defects of direct tolls. It has been the principal means by which the public has obtained the road service it now enjoys and, make no mistake about it, the public even now enjoys a good, if not the best and most desirable road service.

How a petroleum industry that insists as a cardinal principle upon an absolutely unrestricted competition of



Haiss Snow Loader reduces removal costs 51%

in Ludington, Mich. (pop. 9,000)

Snows are heavy and frequent in Ludington.

Formerly, snow was removed by hand, but the City could not afford complete removal and the snow lay piled on important streets until spring. The City experimented with flushing the snow into the sewers with a fire hose, but this clogged the sewers.

In November 1945, Ludington solved its problem by buying a Haiss snow loader. For the first time, its streets could be quickly cleared for traffic—even in the heaviest snows.

James Cartier, Superintendent of Streets, takes pride in what the Haiss loader has done for Ludington and the money it has saved. "Last winter", he said, "we were all cleaned up with the loader and gone home, while nearby towns were still tied up in deep snow".

Below are Mr. Cartier's direct snow removal cost figures:

	Old Method 1944-45	Haiss Method 1945-46
Labor payroll	$4,200	$2,184
Gasoline and oil	3,077	1,634
All other expenses, repairs, etc.	1,423	459
	$8,700	$4,277

SAVING UNDER PREVIOUS YEAR: $4,423 (51 PER CENT).

Thus the direct saving for one year represents approximately 80 per cent of the loader's original cost, and Mr. Cartier's cost records show that the machine had paid for itself by March 1, 1947 (half-way through its second season).

The 18-man crew, (including six truck drivers) which formerly loaded snow by hand could handle only about 48 cubic yards per hour. The 9-man crew (including the same six truck drivers) now used with the Haiss snow loader has loaded as much as 600 cubic yards per hour.

Removing snow in Ludington with the Haiss machine is quick and efficient. The snow is first plowed into windrows in the center of the streets, usually overnight. Then the loader follows quickly, picks up the windrows, and keeps the trucks rolling to the snow dump. All streets are now kept passable throughout the winter.

On January 29, 1947, Ludington had a 12-inch snow storm, with three to seven-foot drifts. The Haiss snow loader was run for 16 consecutive hours. It immediately cleaned 14 downtown blocks representing about two miles of curb. In less than 24 hours, the downtown streets were clear. The rate of loading averaged 10 cubic yards per minute.

Write for full Information on the Haiss snow loader.

* * *

GEORGE HAISS MANUFACTURING CO.

381 CANAL PLACE — NEW YORK 51, N. Y.

outlet will fare if many of our principal lines of highway are occupied by toll facilities is an interesting speculation. One thing is sure, toll roads, wherever they are built, are going to have to scratch for a living. The income derivable from exclusive concessions for various traffic-catering services, including the supply of gasoline, is going to be well-nigh irresistible. It has proved so in all undertakings to the present. It will continue to be so; and gasoline purveyors, those who choose to seek the privilege, are almost sure to find themselves saddled with a charge (or a tax) that they can't pass on; with death to the opportunity for competitive selling in the bargain.

Just one thing more. You ask if I think there is any foundation for your assumption that a factor in the current wave of toll road proposals is "some strong organized pressure possibly from powerful financial interests who underwrite the financing of the bonds." Isn't that a purely rhetorical question? I ask you.

Very truly yours,

THOS. H. McDONALD,
Commissioner of Public Roads.

Few Locations Are OK for Toll Projects

Excerpts from a paper entitled "Urban and Inter-City Road Development," given by Joseph Barnett, Chief, Urban Road Division, Public Roads Administration, at the recent Ohio Engineers' Conference

Toll financing has been suggested as one means of obtaining highways with complete control of access, although the principal objectives are increased revenue and a form of improvement cost which need not be "pay as you go" nor long-term obligations backed by the public credit. Tolls were almost the only means of financing highways when there were no public agencies responsible for their development. The turnpikes of the nineteenth century were such highways. But the extensive highway system we now have did not come about with the aid of direct tolls. While toll facilities such as ferries, bridges, and tunnels, which cross the natural barriers of rivers, have proven desirable and, for the most part, acceptable to the public, there are almost no toll highways. The reason is the fact that in only rare instances can the cost be supported by tolls. This was demonstrated in the report entitled "Toll Roads and Free Roads," House Document No. 272, 76th Congress.

The only modern and truly toll highway now existing is the Pennsylvania Turnpike. It is unique in that mountain ridge barriers lie across the desired routes of travel and tunnels through these barriers combined with a splendid highway make it economically feasible for many vehicles to pay the toll. It is located in a rural area where some of the disadvantages of toll highways are not experienced. Despite these advantages and a substantial government subsidy amounting to 40% of the initial cost, the Pennsylvania Turnpike has had a

(*Continued on page* 96)

STANDARD ENGINEERS NOTEBOOK

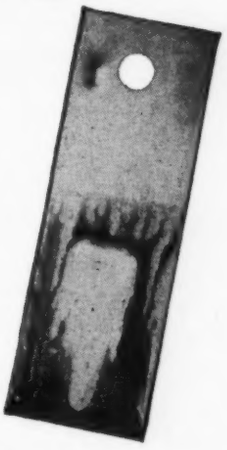
RPM

① Adhering agent in RPM Compounded Motor Oil keeps oil film on all parts after engine stops, even on cylinder walls.

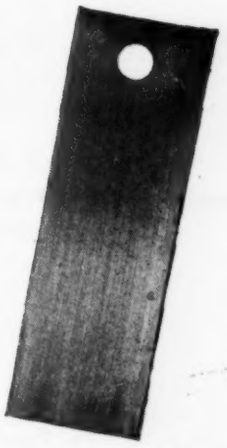
② Rustproofing compounds prevent moisture that condenses on cooling parts from contacting metal.

③ No rust is formed to scrape off when engine starts, and cause excessive wear.

④ Constant lubricant film provides adequate and instant lubrication when engine starts.



This actual photograph shows how one HIGH-QUALITY MOTOR OIL "peeled" off almost all of this test strip of steel when it was placed in corrosive-moisture conditions similar to those in a cooling engine. The oil concentrated at one spot and the unprotected surface quickly rusted.



RPM COMPOUNDED MOTOR OIL kept this strip bright and shiny, completely sealed against rusting, when it was exposed to the same conditions. "RPM" compounds keep a constant rust-proofing lubricant film on engine parts at all times, whether they are idle or moving.

How RPM Motor Oil Rust-Proofs As It Lubricates

Rusting, caused by corrosive moisture, is the greatest source of wear in automotive engines (85%, according to some engineers). It can be controlled by using RPM Compounded Motor Oil.

Additional compounding for "RPM," perfected by Standard of California scientists, provides a rust-proofing lubricant film on internal engine surfaces. The heaviest moisture condensation in idle or cold-running engines will not cut through it.

Other compounds in RPM Motor Oil give it adherent qualities so the film stays on parts at all times. They also loosen and remove gum and lacquer, lubricate hot spots, resist sludge formation, bearing corrosion and stop foaming.

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For additional information and the name of your nearest Distributor, write Standard of California, 225 Bush Street, San Francisco 20, Calif.; The California Oil Company, 30 Rockefeller Plaza, New York 20, N. Y.; The California Company, 17th and Stout Streets, Denver 1, Colo.; Standard Oil Company of Texas, El Paso, Texas.

FOR EVERY NEED A **STANDARD OF CALIFORNIA** JOB-PROVED PRODUCT

(*Continued from page* 94)
precarious financial existence.

Tolls are collected on the Merritt Parkway in Connecticut and will be collected at two points on the Westchester County, New York, parkways if the wrangle over their location is settled. These parkways are not toll highways, however. They were not designed for the collection of tolls. Advantage is being taken of the inertia of most motorists manifest in their willingness to shell out the magical thin dime rather than protest, in order to obtain from them a little additional revenue. There are signs that the patience of motorists in that section is beginning to be overtaxed.

Discusses Maine Project

A toll highway is now under construction in Maine. Here, also, conditions are unique in that a large part of the traffic which will use it is recreational and seasonal, and the location cuts across numerous routes for travel between the interior and the coast. Its justification is not as clear cut, however, as the Pennsylvania Turnpike. The Maine Turnpike embodies many of the objectionable features of toll highways. One of the principal objections is the limited use of points of interchange. This denies the facility to much short haul traffic which invariably is the most of our total traffic. It is reported that interchange on the Maine Turnpike was not justified where the tolls which would be collected at a point would be less than about $25,000 annually for a period of 23 years. This resulted in designing for only three interchanges in addition to the terminals in a length of 47.4 miles, or an average distance between points of interchange of about 12 miles. In addition to restricting the use which will be made of this splendid facility, the collection of tolls will result in wasting at each point of interchange most of the $25,000, for this amount can only cover the cost of collecting tolls and the annual cost of the capital expenditure for the needed improvements for a toll interchange and their operation and maintenance.

The economic impracticability of providing frequent points of interchange condemns toll highways as a means of relieving traffic congestion, particularly in urban and suburban areas. A free-flowing artery for large volumes in urban areas must offer a wide choice of destinations. Points of ingress and egress must fit local traffic needs and be located where proper distribution can be effected. The large areas required for entrance facilities and toll collection generally are not available at these points and if available are costly. It is natural for designers of a toll highway to keep down initial cost and cost of operation by keeping points of interchange to a minimum. Thus a toll highway becomes an inflexible facility with limited use compared to a free facility, even assuming that drivers are willing to pay a direct toll in proportion to use.

Other Possible Projects

In an analysis of possible toll highways for the state of Illinois, ten routes were chosen for detailed study, three in rural areas and seven in the urban area of Chicago. Assumed direct toll charges were ½ cent per mile for passenger vehicles and 3 cents per mile for trucks. None of the facilities figured to be self-liquidating except the Northwest Route in Chicago, for which the base toll rate was increased to 25 cents for the 11.6 miles, about four times the rate first assumed. Of significance is the fact that in all cases the estimated use as a toll facility was only a part of the estimated use as a free facility. Even in the case of the Northwest Route, use as a toll road was calculated to be about 12 million vehicles annually, or only 40% of the estimated 30 million vehicles using it as a free facility. The three rural routes showed use as toll facilities of 60, 60, and 73%, and three other urban routes 40, 40, and 28% of estimated traffic as a free facility.

A free highway costs less than a toll highway of equal merit. At points of interchange, for example, a toll highway generally demands that all eight turning movements be brought to one or at most two toll plazas. Extra bridges and roads are required in addition to the toll collection facilities. On free highways this is unnecessary. In addition, elimination at unimportant grade crossings might be deferred where safe operation is assured, whereas all crossings must be eliminated initially on toll highways. The New Jersey authorities a generation back considered making the Pulaski Skyway a toll facility. It was ideally suited to the collection of tolls because it was really a high level structure over two navigable streams. The cost of providing toll plazas and toll collecting facilities at each ramp was so high and other changes to insure free flow to and from the facility to a volume equal to its capacity were so great that the idea was abandoned. The same reasoning may have been one of the factors in the decision by New York state authorities to abandon the idea of making their 420-mile Thruway a toll highway. It is now under construction as a free expressway of very high standards.

Many Complicating Factors

Sometimes a toll highway may not attract sufficient traffic to eliminate the need for improving parallel free facilities, whereas a free highway of the same standards would. In the urban projects of the Illinois study the volumes of traffic which, it was estimated, would not use the toll highways were much greater than the volumes which would use them. Surely the former road users would not be satisfied with inferior and inadequate facilities and would demand improvements to the existing roads and streets.

There are few, if any, locations where conditions are amenable to the development of toll highways of appreciable length. To be so there must be a combination of need, cost, and benefits such that the toll highway will be used by a sufficient number of direct toll-paying patrons to cover, without subsidy, the annual cost of maintenance, operation and financing. Even where conditions are wholly favorable there is serious question regarding the wisdom of public officials sanctioning the construction of toll roads. Highways are constructed by men with materials and equipment. These are not in abundant supply, as is well known. Public officials must give serious thought to the question, "Shall these commodities, limited in quantity, be applied to toll highways of limited use or shall they be applied to the construction of free highways of comparable design, at less cost, for use by all toward the relief of traffic congestion?"

It appears to me that one of the objectives of toll highways, increased revenues, can be better attained by an increase in the motor fuel tax rate which, in effect, is a toll for the use of all highway facilities. An increase in the rate is justified for two reasons. The sharp decrease in the value of the dollar alone calls for an increase in the rate, for we cannot expect this differential to be absorbed indefinitely by increased efficiency in construction and maintenance as it has in the past. An increase in rate also is justified by the demand for improved facilities of higher utility and greater safety. As road usage soars there is need for more and better facilities. Some increase in facilities can be paid for with increased motor fuel revenue from roads on which the increased traffic does not exceed the capacity of the existing highway. In areas of heavy traffic, however, in-

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crease in travel means more facilities and in addition more costly free-flowing highways are necessary to decrease congestion and increase safety. These facilities should be paid for by state-wide revenues over and above that derived from increase in travel at the existing motor fuel tax rate.

Urban Arterials Have Enormous Value

Arterial routes in urban and suburban areas are economical despite a relatively high initial cost. It is not my purpose to delve into the broad subject of economics of highways except to submit the bare statement that the benefits to road users in reduced cost of operation and saving of time are enormous in the aggregate and for most urban arterial projects justify the costs. When combined with benefits to the city as a whole and benefits in the form of accident reduction, they place even the costly facilities in a position of high priority.

Arterial route improvements should be paralleled with solutions to the other city transportation problems; namely, distributor streets, parking and other terminal facilities, improved transit, and more efficient operation and traffic control. When the problems are attacked on this broad front, we can look forward to real relief of traffic congestion.

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Correction—In August, R&S the article "All Eyes on California" erroneously gave California's new gas tax rate as 6 cents. The correct figure is 4½ cents. An editorial in the same issue quoted the figure $18 billion when it should have read 1.8 billion.

Mail Inserted Card or Inquiry Blank (page 130) for Equipment Data

Again this issue of Roads and Streets carries descriptions of many new labor-saving efficiency devices and latest material developments. See our New Equipment and Materials Section beginning on page 109, for which a numbered reply card has been inserted to help you request data on items that interest you. Also on page 130 is an inquiry blank and advertisers' index which will help you get data on equipment and materials you need.

Photo Clyde Teter, Denver Post

★ Some idea of the difficulty of removing the slide on Floyd Hill is realized by noting the size of the rock to be broken up

How Colorado Dept. Cleaned Up Huge Slide

A 35,000 cu. yd. slide of rock—100% shootin' stuff—came rumbling down over U.S. 40 May 17 near the foot of Floyd Hill, west of Denver. It wasn't just an ordinary slide of loose rock, but a big hunk of mountain which got tired and moved down over the road. State maintenance engineer Douglas Stewart of the Colorado highway department reported the details to us as follows:

"Practically all of it has to be shot before removal. Fortunately, we had a wide shoulder outside of the guard rail and had one-way traffic through in four hours, and the next day, Sunday the 18th, had it widened to two-lane width.

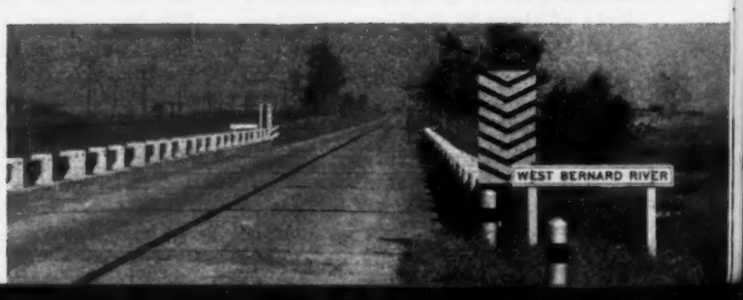
"We used bulldozers; four air compressors; two one-yard power shovels; and two dumptors in addition to maintenance trucks and motor graders. This is about all the equipment we could spare from our normal operations and, inasmuch as traffic was adequately cared for, we cleaned the job up with this equipment. But it will probably take about four weeks from the time of the slide occurring until it is finally cleaned up and the original roadway restored to traffic."

Special Warning Sign for Small Bridges

All over the U. S. motorists continue to meet with wholesale tragedy at narrow bridges.

Such bridges can't all be rebuilt or widened at once, so any device that will effectively warn approaching drivers is worth more than passing notice. Examples of such warnings are pictured herewith. They're from the Yoakum district in Texas, where Mack Hodges, district engineer, has erected these yellow and black signs not only where railings throttle the traffic width down to 18 or 20 ft., but also where 2 ft. extra width of bridge exists. Experience has shown that even this margin of deck width does not completely remove the hazard.

★ (Left): Says Mack Hodges of Yoakum, Texas: "This is one of our first signs, diagonal stripes used. This tends to create an optical illusion and hence our reason for the use of the chevron, or V-type, stripes, as illustrated in other picture. Structure here is 20 ft. in width and the pavement a few feet from either end is 24 ft. in width, formerly an 18 ft. concrete pavement but widened some three or four years ago to 24 ft. by the addition of a 3 ft. strip on either side of the existing pavement. U.S. 59 in Wharton County, Texas. (Upper right): U.S. 59 near Edna in Jackson County, Texas. Pavement is 18 ft., structure width 20 ft. These 2x4 ft. signs reflectorized with glass beads. Says Mr. Hodges, "Since their erection some three or four months ago we have had no report of a collision with the railings on any of the bridges on which they were erected. Prior to their erection several fatal accidents occurred. (Lower right): Another view of marking now is used in Yoakum district. This marker is on U.S. 90-A in Wharton County. Pavement is 20 ft., structure 24 ft. All structures are so marked where the structure width is 4 ft. or less than the pavement width. Note also that the railing on the structure has been reduced to prevent the overhang on transport or cargo trucks coming into a collision with the higher railing



Foundation Design

for 4-level $1,500,000 Interchange at Los Angeles

Contract was awarded 6/24/47 to James I. Barnes for main structure and approaches of grade separation at junction of Hollywood Parkway and Arroyo Seco Harbor Parkway. This article highlights the California Division of Highway's two-year investigation of drainage, soils and soils utilization that preceded the letting

FOR several years the engineering world has been treated to advance sketches of an unprecedented 4-level structure planned for Los Angeles. This structure is now to become a reality, as part of an initial 70-mile 2-axis limited-access system for which several miles of roadway and nearly a score of the 200 bridges are already under contract.

In making preliminary studies to determine the best location of new parkways it was decided that Hollywood Parkway and Harbor Parkway, connecting respectively with Santa Ana and Aroyo Seco parkways, should intersect at a point near the downtown area as shown in Fig. 1. Of course the suitability of the foundation, with its effect on construction cost, as well as traffic needs, enters into the final decision on the location of a major structure. The site of this junction is quite hilly and while preliminary design studies to determine roadway layout and types of structures were in progress, the state also began a preliminary investigation of the drainage and soils conditions. Although subsurface conditions were far from ideal, it was soon decided that the site was feasible but would call for unusually painstaking procedures.

Expansive Material Revealed

In March, 1945, a preliminary report was made which showed that the basic geological formation in this area was covered with 0'-15' of an alluvial material, varying from a silty sand to a sandy clay and silt. Borings were made with a 1-in. Porter-type hand-driven sampler. A 2-in. sampler was also used with a power rig, but borings were in general limited to a depth of about 20 ft. These early borings revealed the presence of an underlying "silt stone," locally called Puente Shale. This so-called bedrock material proved to be an expansive-compressive soil when broken up, having a CBR of 5 to 11, with 2% to 4% 4-day expansion. Borings were located along the centerlines of approach roadways and near abutments of structures, as well as along some of the adjacent ramp locations. This routine study demonstrated three facts of controlling importance: (a) the so-called bedrock was spongy; (b) most of the soil was of poor quality for roadway foundation; (c) moisture content in the existing ground was unusually high.

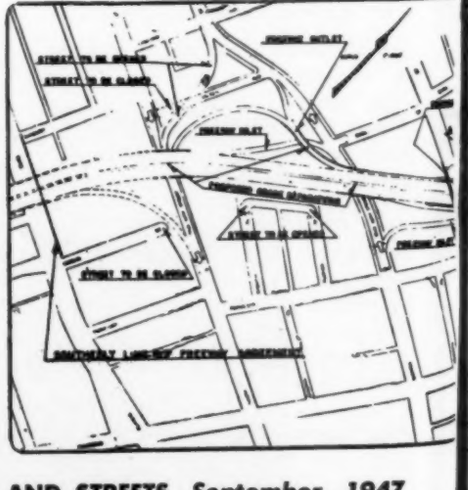
Hence it was decided to make further investigations under two general headings—Ground Water, and Foundation. The Ground Water Report for the vicinity of the 4-level structure was made October, 1945. It was found that the free water level varied from 7 to 15 ft. below the existing ground surface. A map and series of profiles were drawn showing the free ground water contour in relation to existing surface and location of proposed roadways and structures. (Fig. 4). The seepage zone proved to be confined largely to a band of alluvium 5 to 20 ft. thick, some of which was man-made fill. Most of the flow occurred along sandy seams somewhere within this band, flow involving a hydraulic grade of 3% to 4%.

The source was principally surface drainage; underground drainage of the entire 214-acre water-shed drains in a direction across the axis of Harbor Parkway. It was estimated that 10% of the average annual rainfall of 15.72 in. would supply an underground reservoir 4.76 acres in extent and 15 ft. deep.

An attempt was made to determine the rate of flow in the seepage zone. For this purpose 4-in. and 6-in. water holes were drilled to the bottom of the underground reservoir or seepage zone, supplemented by 1-in. borings placed radially at various distances. Water was then pumped from these large holes at a rate sufficient to maintain a depressed ground water level of 15 ft. below the normal level. The drop in water level in surrounding holes was also noted, to gain an idea of the permeability of the soil. Flows of 28 and 90 gph. were developed from the 4 in. and the 6 in. holes, respectively, involving a permeability factor of 1.65 and 3.57 ft. per day.

All possible sources of ground water were investigated. The principal sources proved to be: percolation from the surface, travel along faults, and leakage from utilities. From 5% to 28% of the water in this seepage zone could be possibly charged to leakage in water or sewer lines in the existing network of mains and distribution lines within the area. Sanitary sewer losses, however, were proved by chemical analysis to be minor.

Since oil wells drilled in the immediate vicinity didn't encounter ground water until 800 ft. down, it was proved clearly that the high water table near the surface is a local perched table high above the general ground water level of the Los Angeles basin.



These hydraulic studies were made in accordance with the theory and procedure given on p. 298 of "Flow of Homogeneous Fluids through Porous Media", by Morros Muskat.*

During this phase of the investigation the proposed cut slopes and adjacent ground were analyzed for stability and found to be safe. The under-drainage problem proved to be a rather minor one, once the analysis was completed, and plans finally called for installation of about 140 ft. of intercepting underdrain along a low part of the area. The significance of this study isn't that the drainage solution was complicated or difficult, but that such a thorough investigation was made to remove all doubt as to the possible effect of ground water on subsequent design.

Soil Studies and Recommendations

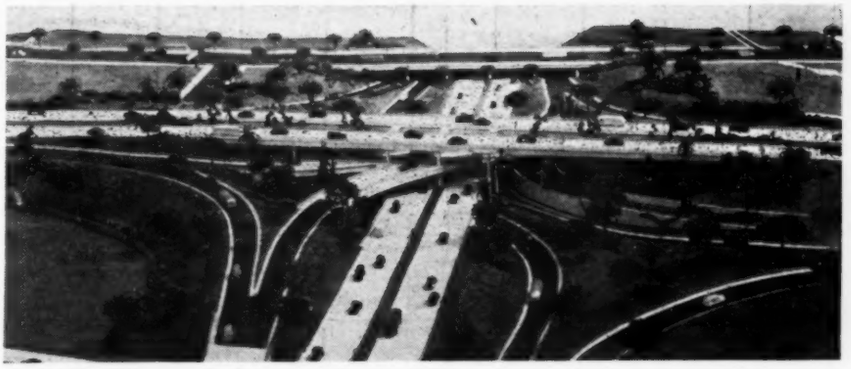
The soil, previously described as being expansive and of generally low bearing value, was found to have a high moisture content, ranging from 15 to 44% and averaging 32% or far too much for proper compaction in the fills. The classification is A-7. General recommendations were made as follows:

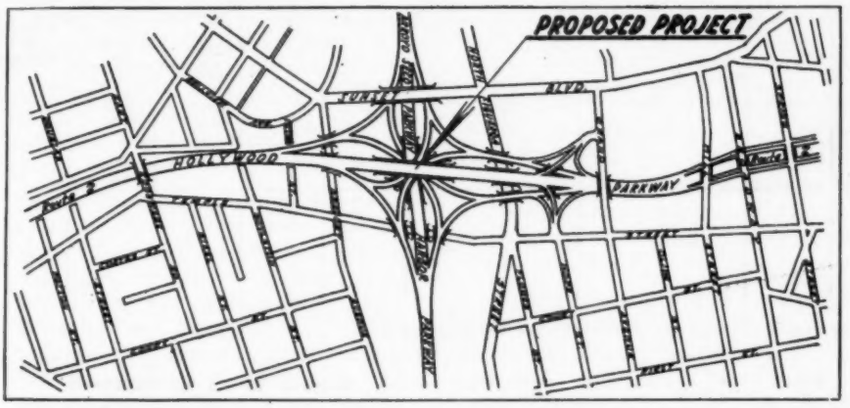
(1) Accurate settlement records are to be taken during the construction period and afterward, from settlement platforms. Platforms will be located at the base of each approach or ramp roadway fill to each structure.

(2) All structure loads are to be transferred to bedding material below the alluvial cover, by means of piles driven several feet into the cover. H-piles are to penetrate compacted embankments and puncture through the sandstone or hard shale.

(3) Settlement is to be observed as construction progresses, from which will be determined the time lag and surcharge, if any, necessary to effect proper settlement before constructing bridge decks or laying pavement on approach fills. Temporary pavement may be necessary for a period following completion of structures and fills.

*McGraw-Hill Book Company (1937).





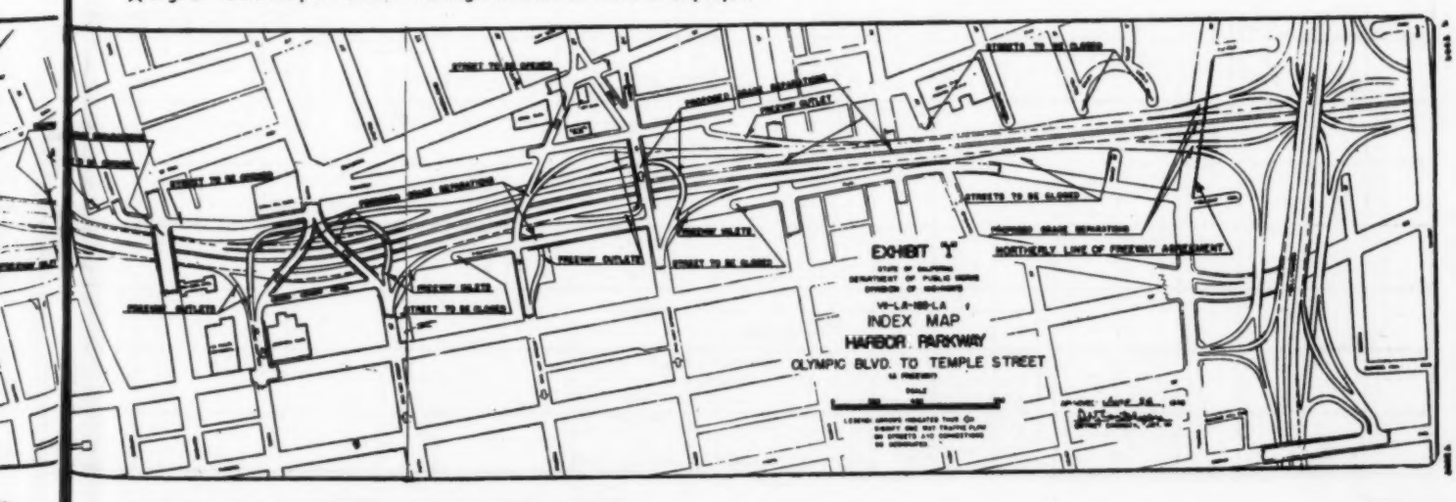
★ Fig. 1—Index or strip map, condensed and simplified, showing the project in relation to the ultimate Harbor Drive development through this area

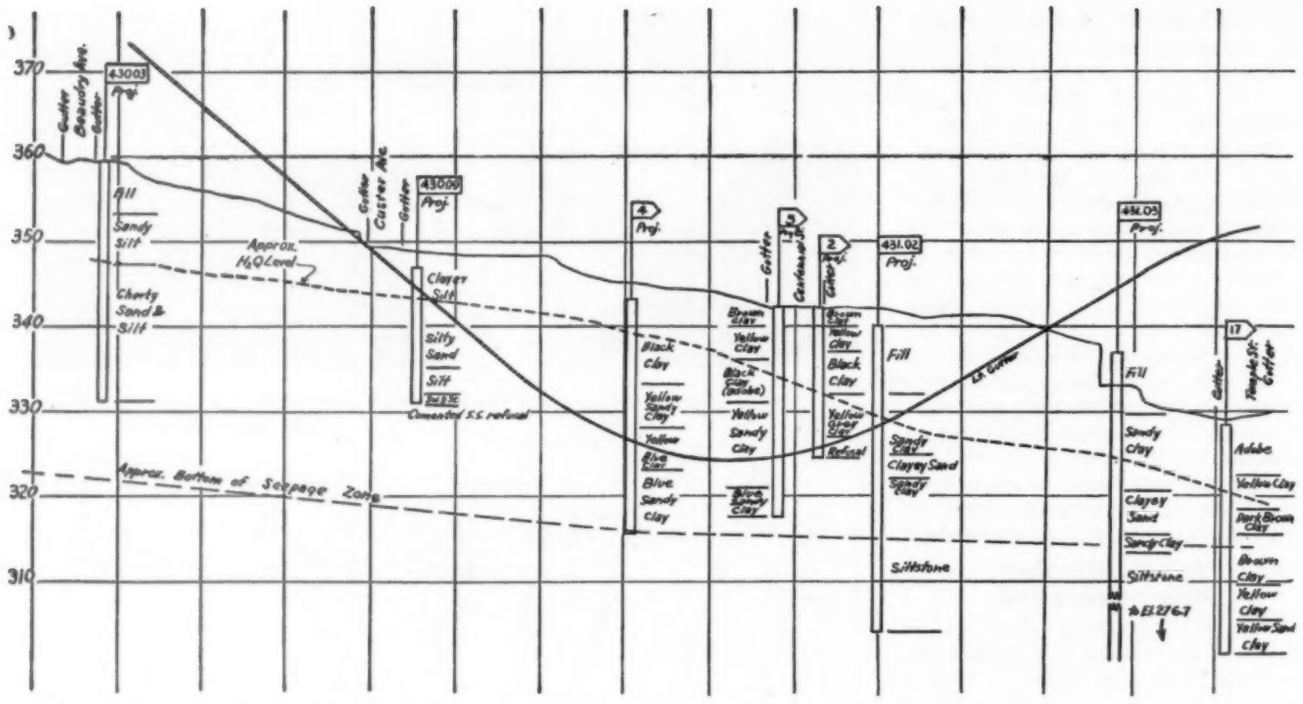
Pre-consolidation pressure relationships were determined as part of complete soil studies, utilizing data from about 100 consolidation tests from 1-in. cores. These tests were conducted in the Los Angeles district soils laboratory in conjunction with a smaller number of tests on 2-in. cores run at the headquarters materials laboratory at Sacramento. The 1-in. borings this time were taken to about 60 ft., again using a hand sampler, while the 2-in. power borings were carried down to depths ranging from 75 to 108 ft.

Individual Footing Analysis

Each structure footing location was given a separate analysis for settlement, based on depths, nature and condition of foundation material, and load. Each footing is designed for predicted differential settlements, this settlement varying from .11 to .66 ft. at piers and abutments with piles in place. Roadway fills of various depths involved are expected to consolidate from .27 to .94 ft. gross, or .13 to .42 ft. net.

★ Fig. 2—General plan sketch showing elements of the 4-level project





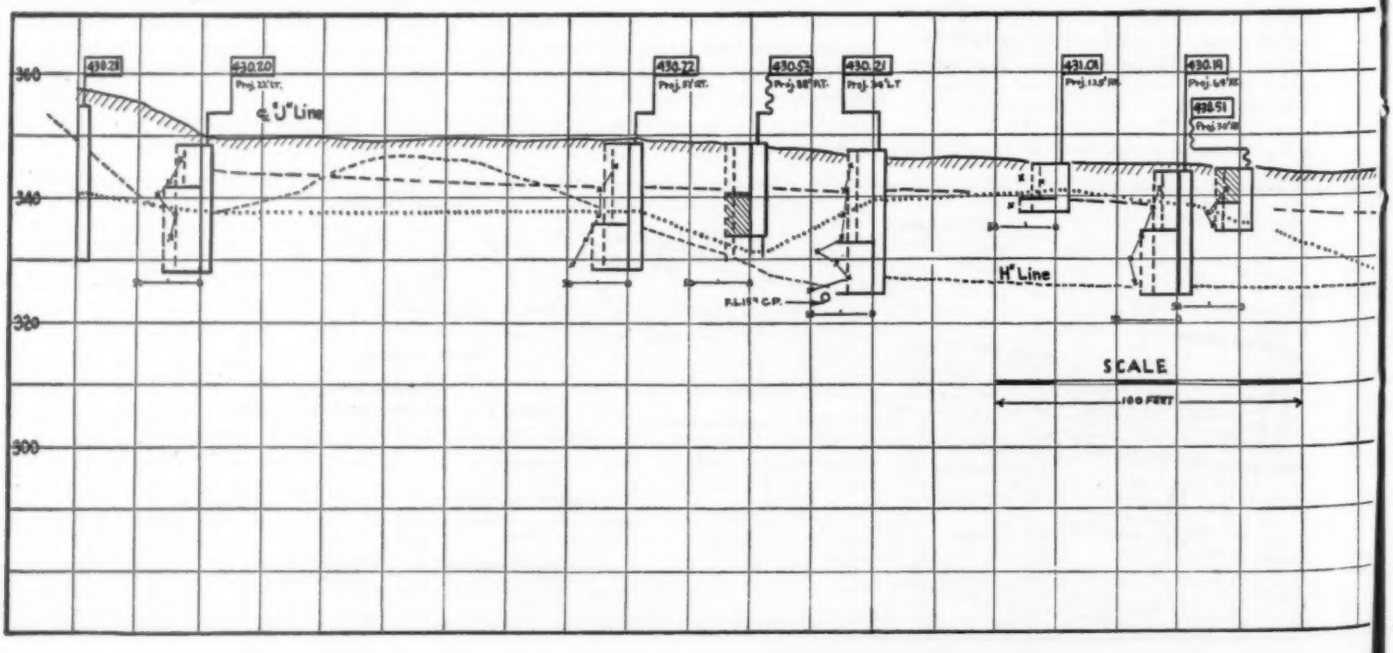
★ Fig. 3—Typical soil profile along a lower gutter line

Since rigid frame and continuous frame structures are involved, the importance of this phase of the design can be readily seen. Diagrams were drawn up showing the pressures with depths under each footing and settlement curves to be anticipated in design. Differential settlement is to be minimized by adjusting pile lengths. End bents of abutments will have longer piles due to proximity of deep approach fill. Settlement checks are also considered vitally important in determining when it is safe to proceed with concreting of the deck.

Liquid Limit to Control

New in California practice is the decision in this instance to utilize the Liquid Limit test as the controlling test in determining soil acceptable for use in the fills. The use of high moisture content material in fills wasn't contemplated in the original scheme for this project. The highway department had expected to utilize material from nearby Fort Monroe Hill excavation, where cuts as deep as 100 ft. were planned. It was impossible to clear buildings from this area in time to use the excavation for the fills at the 4-level structure. With this expected source of good material "out," it became necessary to give new attention to use of the poor material at the site, with the idea of utilizing selected areas of the excavated material and possibly drying or treating local soil with portland cement. A series of special tests was run, from which it was found that the soil would have sufficient shearing resistance to embankment loads provided it were thoroughly compacted and that moisture content was less than 55% of its Liquid Limit.

★ Fig. 4—Sheet showing moisture content of native soil



These studies showed the prevalence of two general types of soil, both classified geologically as Puente Shale. These soils are illustrated by the following typical test hole descriptions:

(1) Hole 50—"Grey to light brown. Looks comparatively dry but with a little manipulation develops a wet, soapy feeling. Little sand felt in fingers. Ribbons out some, but breaks up and acts like silt with more manipulation. Diatomaceous.

(2) Hole 51 — "Color generally darker and with great variety. Green, brown and gray. Bedding planes usually distinct. Soil looks and acts more like clay. Sandy feeling.

Bidders on this project had their attention specially called to the unusually high moisture content and other characteristics of material to be excavated, and specifically to the fact that the suitability of excavated material for embankments was to be determined by the L. L. test as work progressed or as directed by the engineer. A series of tests was run by the district and headquarters laboratory to determine the consolidation that might take place in the fill if built up entirely with the local material without first drying it out, and also for consolidation with 3%, 4% and 5% cement treatment and with a blend of local and imported material. The recourse of importing material for alternate layers with selected excavated material was decided on as being the most economical.

Borrow from Disposal Site

The state had anticipated the need for a site for disposal of large quantities of unsatisfactory excavated material, and the site recently purchased is located 1¾ miles from the 4-level project. The contractors used this site in bidding, and also figured on the availability of ideal borrow material found to exist in sandstone ribbed outcroppings here. This soft, loosely cemented sandstone material will be easy to load with shovels.

All this is a dream come true, from the contractor's standpoint, being able to get his borrow from his disposal site and thus eliminate nearly all deadheading of trucks. However, outside of the first excavation for storm drains and subdrains, the site soil is so prevailingly poor that most of it will be wasted. As it is, the contractor will have to do some drying or blending of excavated materials to keep within the prescribed L. L.

The final design for the embankments calls for alternate layers of suitable excavated material and imported borrow. The bottom 24 in. of fills is to consist of borrow, after which alternate layers each 4 in. loose thickness will be placed.

A further refinement in the embankment design is specified, in that the relative compaction of the excavated and imported materials shall not be less than 90% of the weighted average of the values for the separate compacted materials. Values are to be determined by the standard California 5-layer test.

The design of the parkway roadway pavement and base, as presently determined, includes 16 in. of sub-base and base material, the upper portion of which is to be cement treated, plus 8 in. uniform thickness p.c. concrete.

The foregoing work was conducted by the California division of highways: Los Angeles district staff, S. V. Cortelyou, district engineer, in cooperation with headquarters personnel.

50 N. Y. Cities Surveyed

By the end of 1947 the New York State Department of Public Works will have surveyed traffic conditions in nearly 50 cities of the state. These surveys are preparatory to the development of plans for construction of state-financed urban arterial routes.

Meetings Ahead

Institute of Traffic Engineers—18th Annual meeting, Hotel Fort Shelby, Detroit, Mich.; Oct. 1-4.

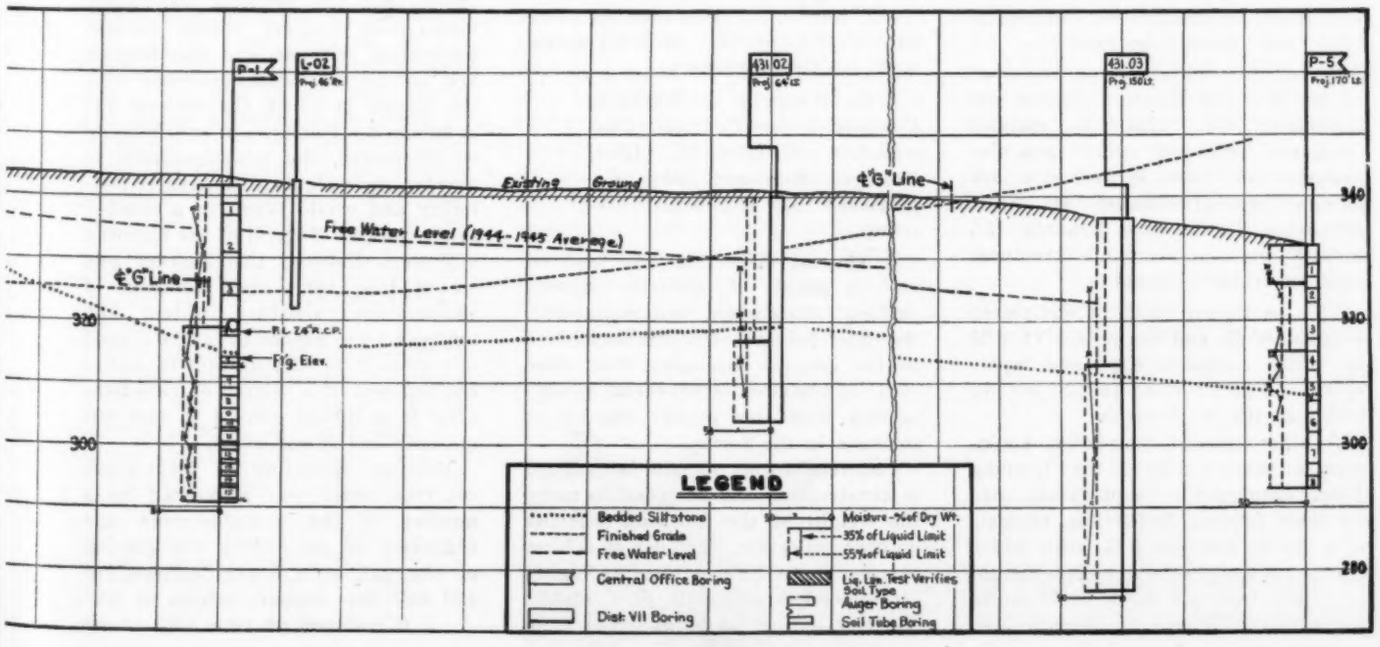
American Public Works Association —Annual public works congress, Jacksonville, Fla.; George Washington Hotel, Oct. 6-8.

Highway Research Board—Annual meeting, National Academy of Sciences Building, Washington, D. C., Dec. 1-6.

American Road Builders' Association—annual convention, Washington, D. C., Jan. 26-28. (1948 road show July 16-20 Soldier Field, Chicago).

Associated General Contractors of America, Inc.—29th annual convention, Dallas, Texas, Feb. 9-12, 1948. (Fall meeting of governing and advisory boards, Des Moines, Sept. 29-Oct. 1).

Associated Equipment Distributors —Annual meeting, Edgewater Beach Hotel, Chicago, Ill., Feb. 15-19.



Heard at ARBA's New England Equipment Conference

Granular soil compaction methods, status of concrete and asphalt paving equipment, aired at Boston

CONTINUING its excellently staged regional meetings on soils and paving equipment, the American Road Builders' Association held a 2-day conference in Boston, June 5 and 6. Following is a highlight summary, supplied through the courtesy of the Massachusetts Department of Public Works. As with other such conferences this one was attended by engineer, contractor and manufacturer representatives.

1. *Development of Highway Equipment for Soils Construction—Earl F. Bennett, Soils Engineer, N. Y. State Department of Public Works presiding. C. W. Allen, Research Engineer, Ohio Department of Highways, leading the discussion.*

This session dealt primarily with the compaction of granular soils containing little or no clay to required density. Various methods of compaction were discussed leading to further discussion as to proper specifications for compaction. A number of ideas were expressed as to the advisability of the universal adoption of an end specification stressing the density of the compacted product rather than the mechanical operations required to obtain the compaction. The AASHO specification seemed to meet with general approval.

An electric vibrator was described by Mr. Davis of Electric Tamper and Equipment Co., which he claimed compacts sand or other granular material four times as fast as a jack hammer type of vibrator. Its use is advocated for settling granular fill in crib work and around structures such as bridge abutments.

This particular piece of equipment weighs 180 lb. and has a base 11 x 30 in. which compacts dry sand layers of from 6 to 12 in. to 100 lb. density in 2 minutes of operation.

Another type of compaction equipment or tamp similar to the "Leaping Lena" developed in Germany and used on their famous Autobahns, consists of a 200 lb. machine 4 ft. high, which jumps up and down to a clear height of 14 in., making from 50 to 60 jumps per minute. It may be operated and directed with only one hand and is particularly adaptable for use in backfilling trenches and around bridge abutments. This piece of equipment retails at a cost of from $400 to $500.

A heavy tandem roller with a vibrating wheel has been developed experimentally and used on dry macadam road construction. This equipment is still in an experimental stage of development and considerable research will be done with it before it is produced commercially.

Considerable success has been experienced with heavy pneumatic tired rollers with a total weight of from 50 to 200 tons. A single axle semi-trailer type weighing 50 tons on four 14 x 24 in. tires oscillates up and down and compacts the surface to greater depth with fewer passes. It is claimed that this type of roller is superior to the conventional sheepsfoot roller. Loaded low bed trailers with pneumatic tires also do an excellent job.

It seemed to be the consensus of opinion of the group that where good granular and gravel soils are available no trouble is experienced in compacting with a smooth roller of the conventional type, but that where fine sands and silts are found more care must be taken to secure proper compaction and specially designed equipment is often necessary.

2. *Development of Highway Equipment for Concrete Construction. Charles W. Allen, Research Engineer, Ohio Department of Highways presiding.*

A general discussion was held on various phases of concrete roadway surface construction and equipment, the chief feature of which seemed to be the general conclusion that some form of vibration is beneficial in connection with the proper placing of concrete in the forms.

Concrete forms should be rugged in construction and designed to carry the weight of the finishing machine without deflection. The use of a form tamper to hold form rigid is highly recommended and will give results superior to that to be expected from 6 or 8 men operating hand tampers.

In use of transit-mix concrete particular emphasis was placed on the need of more rigid control of the water content and operation of the water supply valve from the water tank on the truck.

In connection with the use of batch mixers it was stated that the 34-E dual drum mixer is about the largest size permissible and that from a standpoint of weight and cost the use of this size is confined to only the largest jobs. The 27-E mixer is about as large as can be economically handled on the average job.

The development of machine spreaders for spreading and vibrating the concrete as it is placed between the forms is an outstanding advance over hand spreading. The stiff mixes required especially with the vinsol-resin cement makes hand spreading extremely difficult and impossible to spread as evenly as with the machine spreader.

It was brought out that variations in lane width should be kept to a minimum in both the interest of the manufacturer and the contractor.

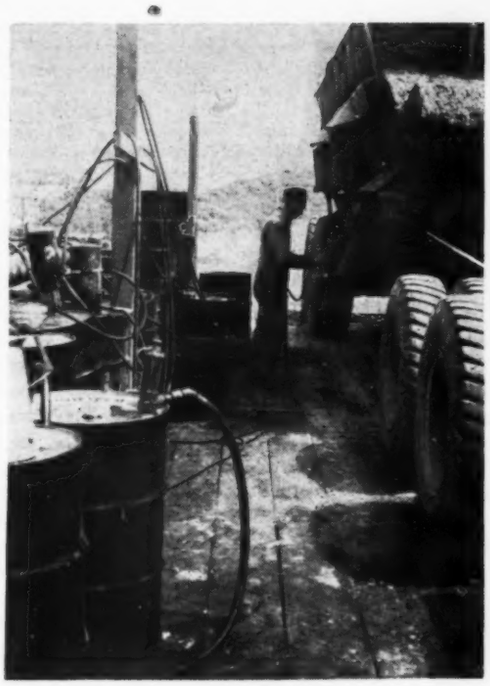
Jaeger has developed a new finishing machine with a diagonal screed which is said to produce a more even surface than some conventional types. There are only a few of these manufactured to date.

3. *Development of Highway Equipment for Bituminous Construction. A. V. Bratt, Chief of Laboratory, Massachusetts Dept. of Public Works presiding.*

Considerable discussion developed over the matter of specification for bituminous concrete plants, it being the opinion of some of the manufacturers that the agencies purchasing bituminous concrete should content themselves with an end specification and not be too much concerned with the means in which the desired end is attained. This type of specification would permit the manufacturers to develop their plants with greater flexibility and would result in a number of economies. Several of the highway engineers disputed this concept and stated that very rigid controls of temperature, moisture content and aggregate are needed to insure a good mix since it is very difficult to secure the removal of a section of pavement after it is placed even if it does not meet an end specification.

Machine spreading of bituminous concrete mixes was advocated by a number of the manufacturers and engineers as permitting the placing of the mix at a lower temperature and with less asphalt content as well

(*Continued on page* 123)



★ A lighter grease is used for trailer fittings than for trucks and semi's, due to greater dust exposure

How Guy F. Atkinson Company Services

70 BIG RIGS

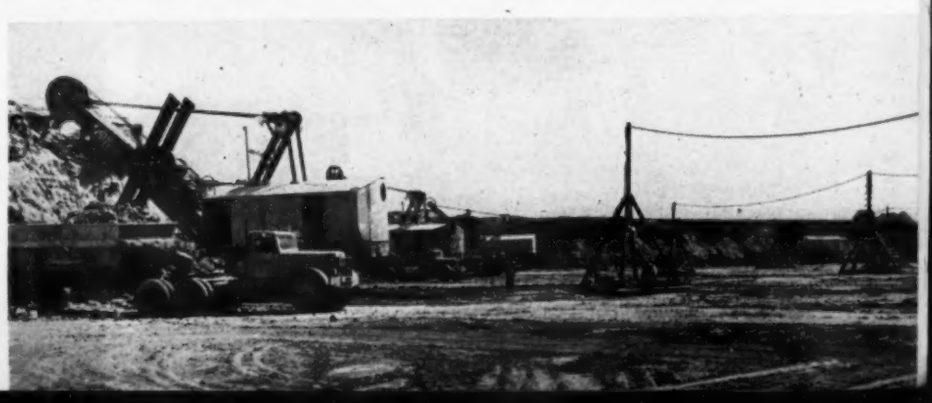
Modern field shop and big-time service facilities speeding earth hauling on 5,000,000 c.y., $3,750,000 extension contract at San Francisco airport

ONE of the best equipment shows to be seen anywhere today is the three-ring circus Guy F. Atkinson Company is putting on at the San Francisco International Airport. Consider a five-million-yard filling job, requiring a 4 to 5 mile haul from a huge hill-top pit down to San Francisco bay, and you have the setting. Imagine four 6-yd. electric shovels plus a 3-yd. and 2½-yd. diesel shovel dispatching a 70-wagon fleet of units ranging up to 27 yd. struck capacity, assisted by 14 heavy tractors, 4 patrol graders and miscellaneous equipment, and you have a picture of the actors. Unless the real actors are the human workers on the payroll, who number some 300 men on two shifts—80 being mechanics and servicemen.

To complete the picture, conjure up a big open California-type field shop as the "big tent," flanked with an 8-pump greasing platform that dispenses lubricants wholesale, and by two fueling stations (one gas, one diesel) that tank 'em up a score of rigs at a time from 8 hose lines. This gives you some idea of the Atkinson set-up, which is both similar to and different from the preceding 6,000,000 c. y. operation performed by Macco-Morrison & Knudson Co. This latter firm [see Feb. and April '47 R & S] had achieved several consecutive million-yard months from the same pit over the same haul road on the original grading parcel, and had invested heavily in a quarter-million-dollar private haul road, embodying three bridges over arterial highway and rail lines and a thick 40-ft.-wide asphaltic concrete pavement. Macco-M-K also pioneered in the use of the 27-yd. Southwestern dump wagons and in large-scale use of the Dixson-Wagon 16-yd. rigs, both types being capable of 30-40 mph. operation. This firm has also worked since mid-year 1946 on the grading and paving of a nearby section of the Bayshore freeway for the state highway department. What happened was that Guy F. Atkinson Company, who also was in the area working on a section of freeway near the airport, under bid when the 5,000,000 yd. airport fill extension job came up this spring got the new work and bought out Macco-M-K's big Southwest trucks. Exercising an option to utilize the Macco-M-K haul road and pit for a consideration, the Atkinson firm also brought in new hauling equipment of its own, and put in its own big shovels. Atkinson's equipment lineup as of late May this year when it was just beginning to roll, included the following:

In the pit: Four 6-yd. Bucyrus-Erie electric shovels, one 54-B Bucyrus-Erie 3-yd. and one Northwest 2½-yd. diesel shovel.

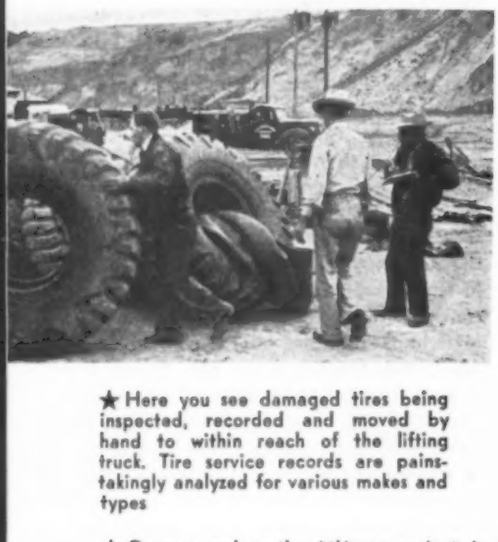
On the road: The work was begun



★ Close-up of four 120-Bs. Note use of cable towers, elevating the power cables to permit maximum maneuverability of trucks in getting in to the shovels

★ The Field Shop Area on the old pit floor as seen from a bench 70 ft. higher. (1) Grease pit, (2) diesel fueling racks, (3) gasoline racks, (4) haul road on 5% max. grade, (5) tire service station, (6) main shop buildng as seen from rear, (7) warehouse. Note spaciousness of this entire layout—aid to easy maneuvering, turning around, etc.

★ Each tire gets number-branded wtih a hot iron to facilitate service records



★ Here you see damaged tires being inspected, recorded and moved by hand to within reach of the lifting truck. Tire service records are painstakingly analyzed for various makes and types

with 30 Southwestern bottom-dump trailer units with Peterbilt tractors (purchased from first contractor); 12 new Peterbilt tractors with 22-yd. rear dump utility trailers using 300 hp. Hall Scott motors; 14 Knuckey-Western end-dump rock trucks of 20-yd. capacity; and 12 of the familiar 13-yd. bottom-dump Euclids—68 hauling rigs in all. The Westerns and Euclids were on the job early in order to pioneer both the pit and the fill. Later in the summer these units were replaced with 17-yd. end-dump Peterbilts and 12 to 14-yd. Bobtails.

On the fill and pit floor: 14 D 8 Caterpillar tractors with assorted dozers.

Maintaining haul road and on the fill: Four Caterpillar motor patrols.

Adding to the melee on the haul road was the fact that Macco-M-K were still hauling fill and ballast for the freeway, with their fleet of Dixson earth wagons kept over from the airport run. An idea of the mechanical horsepower burned up in a double-shift day of 16 hours during June, is gained from the fact that on a typical day the two contractors together took 3,126 loads over the road, returning empty. That's 195 trucks per hour each way, or one every 18 seconds. Atkinson expects this summer to attain the million-yard months achieved last year by the Macco-M-K outfit, and in the weeks since the April letting had already geared up to half that rate, hauling from high in the pit. They figure on being done by November.

Plenty of Space

Much of interest could be described about all the phases of Atkinson job, but this story will be confined to the shop and service set-up. To begin with, Atkinson chose to build their field shop at the pit, where they could capitalize on the nearly flat, well-drained pit floor which required no further grading or surfacing to afford an ideal "stock pen." Moreover, with their trucks at the pit, an absolute minimum of time is lost in going to work at the start of each shift. The shop itself is an open bay affair, with wide stalls for simultaneous overhauls on five big rigs. This arrangement has proved ample for most purposes, the overflow being taken care of out in the open. The shop space, as pictured, contains no unusual equipment, but is completely tooled for everything except precision grinding which is taken into South San Francisco to the Atkinson home shop or elsewhere.

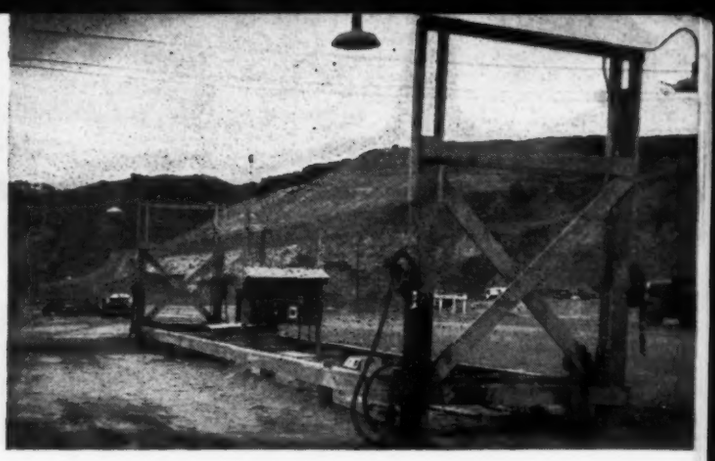
A heavy-duty hoist rail with one or more chain hoists runs along the ceiling, crossing all bays. Under the bench are hinged doors with parts bins and tool drawers. The concrete floor, be it noted, is kept well broomed, and no electric cable or air hose is allowed on the floor a minute longer than necessary.

At one end of the shop building there's a long fully enclosed stock room and tool house, having, as a notable feature, a platform at truck-bed height to speed unloading of supplies.

Tire Carrier Rig

The first special feature of the work to really catch our eye was the way the Atkinson outfit has eliminated grunting and sweating and de-

★ Oscar award on the Atkinson project, in our opinion, goes to this tire handling outfit—fast, hill-climbing converted Army weapons carrier, complete with hoist, compressor, airfield siren and special lights



★ Inside the field shop—note the handy location of the hoist rail. Also the built-in tool and small-parts cabinets under the bench. (Right): Another view of the diesel fuel station

lays in handling tires. It has about 1,050 tires on the ground and some 65 spares always coming up. Some are big back-breaking 2400 x 32's and there are 13 sizes in all, ranging down through 2100 x 24's to 900 x 13's. The thing that cut tire time and labor to a frazzle is the converted Army weapons carrier pictured. A fast, mobile all-wheel-drive rig—able to climb anywhere a scraper or tractor can go, and scuttle along like a rabbit—this machine is fixed up with an overhead frame and winch-operated hoist line so that it can pick up, carry and set down the biggest tire with ease. A compressor mounted in the bed blows tires up to pressure. To make the outfit complete there's a flag, siren and signal lights for use in crossing airport areas in emergency.

Tire servicing, inspection and change are reduced to a slick routine. Every tire brought on the job is immediately branded with a number, and from that moment on until it is worn out, a chronological record is kept of the machine it is on, hours of service on that machine, number and weight of loads, nature and cost of repair work done, etc. Tires are constantly being taken off, inspected and if necessary sent into the city for repairs, and some tires will have served on many different machines in their lifetime. The tire service truck heretofore described is manned by a group of drivers long experienced on heavy tires.

Tires are inspected individually with care by a man who does nothing else than this, this fellow usually catching them as the machine is refueled. He taps each tire with a flat nosed hammer to quickly check air pressures, and marks tires that look as though the operator had better pull over to the side for a change.

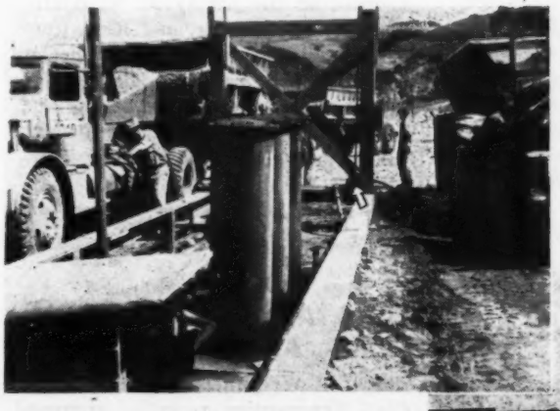
Wholesale Refueling

Next let us look at the refueling arrangement. Here again is something not seen every day. Arranged in widely spaced parallel position adjacent to the main haul road are two

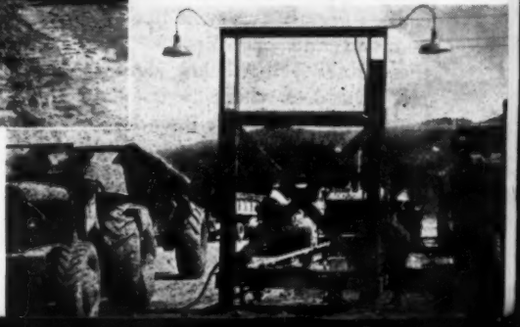
★ Showing the gas refueling racks (left) and the diesel racks (right) in relation to the adjoining haul road. There's space for two or even three lines of machines between racks, and for single lines outside

★ Guy with the hammer is making routine tire check during refueling

rectangular wooden frames, each supporting hose reels at their corners. One rack is for 4 diesel fuel lines—the one nearest the road. The other is for gasoline, two gas lines serving the Hall Scott motors in the Peterbilt tractors and other equipment. About 50,000 gal. of gasoline and 100,000 gal. of diesel fuel per month will be used during peak hauling. Fuel is stored in underground tanks—20,000 gal. for diesel and 10,000 for gas — and automatically controlled electric fuel pumps and meters simplify refueling and bookkeeping.



★ More views of the refueling operations. Note details of hose reels, surge tanks, electric pump and pressure controls. Arrow shows meter—there being one for each line



★ Panoramic view of Borrow Pit, after approximately 2¾ million yards removed. Four 6 cu. yd. 120-B Bucyrus-Erie Electric Shovels are on lower bench with 54-B Bucyrus and 80-D Northwest on top bench. Note Caterpillar 12 Blade at work maintaining pit

★ View along the 60' haul road showing returning empties, plus highway-size water truck sprinkling the shoulder. Peterbilt Tractor with Utility Trailer in foreground followed by two Peterbilt Tractors with Southwest Trailers

Truck and trailer operators do most of their refueling at shift-change time, pulling up in double or single lines on either side of the racks.

Greasing 60 a Day

Lubricants are also dispensed in wholesale lots. Lubricating oil is purchased in carload lots of 50-gal. drums, and a forest of drums is stored on the job where any of the eight 100-lb. pressure pumps with extension hose can be quickly mounted. Four men work at the pit on days and 5 men during the graveyard shift, when most of the greasing and oil changing are done. At the time of the editor's visit the night men came on at 10 p. m. at the end of the double-shift day, and in 2½ hours before resumption of work usually serviced 50 to 60 machines. Then begins the day work, which catches stragglers and special servicing needs. The foreman comes on at 6:30 a. m., a helper at 8 a. m. and a second shift man at 2:00 p. m.

All equipment is Alemite. The 8-pump system includes one hose for chassis grease, two hose lines for 140 gear oil and one for 250 gear oil, these lines being below deck in the pit. On deck there is one line for motor oil, two grease lines for use on trailer fittings, and a water hose for radiators, all of which are checked each trip in.

It is interesting to note that a lighter grade of grease has been used for trailers than for truck chassis points, the trailers getting 250 gear oil on fittings because of the greater exposure to dust of their long wheelbase bodies.

Crank case changes are concentrated on week-ends (between 5-day weeks), all equipment being changed at that time and some 800 gal. of oil being a not unusual requirement. Earl Halliday, servicing superintendent, has to see that complete records are kept of date, time of day and amounts of fuels and lubricants of the various grades used on each rig.

Guy F. Atkinson Company is represented on the job by R. W. Atkinson, project manager, and R. J. Conley, superintendent. Bruce Wheeler is mechanical superintendent. The San Francisco airport is designed and supervised by the Bureau of Design, San Francisco Public Utilities Commission, B. M. Doolin, airport manager and A. J. Wehner, project engineer.

CAA Announces Revised F.A. Airport Program

T. P. Wright, Administrator of Civil Aeronautics, recently, approved the revised Federal-aid airport program to be undertaken from funds appropriated for fiscal years 1947 and 1948, $45,000,000 and $32,500,000, respectively, which have been merged and are to be administered as one fund.

The program calls for the construction or improvement of 908 airports at an estimated cost to the Federal Government of $66,569,590, with local or state sponsors providing an additional $70,235,095.

The CAA's primary consideration was aeronautical necessity. It has not been able to program all projects applying for federal assistance. The CAA has on file now a backlog of approximately $250,000,000 in such requests.

The program includes 896 projects for the continental United States, of which 725 are for the construction or improvement of the Class 1, 2 and 3 category and 171 are Class 4 or larger, of which only 3 involve the construction of new Class 4 or larger airports. To date, 12 projects have been programmed in the Territories and Puerto Rico.

•

R. Cavendish

Ray Cavendish, veteran of 27 years in West Virginia highway construction and maintenance, has been appointed Road Commissioner of that state, succeeding E. L. Worthington, who resigned to accept a State Department assignment in Greece.

The new commissioner has been with the Commission continuously since 1933. Before that he worked for the Commission for two years and for the Kanawha county engineering department for 12 years, a decade of the former being as office and construction engineer. He was appointed State Maintenance engineer in February, 1946.

New Construction Equipment and Materials

1

New Tractor-Scraper Combination

The "Moto-Scraper," the first addition to the company's new line of rubber-tired tractors and allied earth moving units, has been announced by La Plant-Choate Manufacturing Co., Inc., Cedar Rapids, Ia. The "Moto-Scraper" is a modern high speed tractor-scraper combination consisting of a two-wheeled rubber tired tractor joined to a 17.5 yd. scraper by a pedestal hitch assembly to form a single integral self-propelled unit. The tractor is equipped with a 225 HP Diesel engine and extra large 21:00x29 tires. It has four speeds forward and one reverse. Top travel speed is 18 mph at 1800 engine RPM. The scraper is a positive forced ejection type, operated by a LaPlant-Choate air actuated cable power control unit, mounted on the rear of the tractor and deriving its power from

The "Moto-Scraper"

the main engine. Steering of the unit is accomplished by two double acting hydraulic jacks which are positively controlled by an LPC fluid power unit mounted on the front of the tractor. The unit is equipped with four wheel brakes, air-actuated, with controls arranged in such a way that braking power can be applied to the scraper wheels alone or to the complete unit. Controls for the entire unit are located conveniently in the operator's compartment. The "Moto-Scraper" has a length of 34 ft. 10 in.; width, 11 ft. 6 in.; height, 9 ft. 8 in. and weighs 42,500 lbs. Its wheel base is 21½ ft. and it has a level turning radius of 27 ft. For maximum traction and maneuverability, approximately 70% of the empty weight of the unit is concentrated on its front axle.

2

New Loading Unit

A new loading unit for use with the International industrial Model I-6

Marmach Loader in dumping position

wheel tractor has been developed by Marion Machine Co., Marion, N. C. This unit is an overhead loading attachment that requires no turning of the tractor.

3

Lubricating Grease

Production of a relatively new lubricating grease for open gears and bearings has been announced by Knapp Mills, Inc., New York, N. Y. The product, named Lead Lube, is a mixture of extremely fine metallic lead powder, and high grade lubricating grease. It has been employed for about ten years in the Mining Industry, where lubricating conditions are extremely severe, in that the equipment is frequently in the open, exposed to the weather, and gear and bearing surfaces are subjected to slimes and grit. Knapp Mills, Inc., has now set up production facilities to produce this product for the general industrial market, and recommend its employment for open gears and bearings, chain drives, farming equipment, for cranes, and in the Marine Industry, etc.

Mail Inserted Card

For data on equipment described on these pages. See also inquiry blank on page 130

4

New Street Sweeper

Featuring high speed during sweeping operations and between jobs, and large capacity, a new street sweeper has been introduced by Lorraine, Inc., Santa Monica, Calif. The sweeper is claimed to sweep at a speed up to 10 miles per hour, and to travel at a rate up to 55 miles per hour between jobs. It has a hopper capacity of 2 cu. yd. Operation of the Lorraine street sweeper is simple: As it lays down a fine spray to settle dust, a revolving gutter broom whirls dirt under the truck. Water tank capacity is 200 gal. The rear broom then

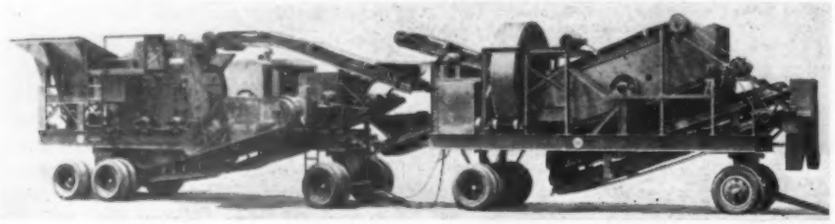
Lorraine Street Sweeper

sweeps the dirt thrown into its path into the opening. Inside, an elevator carries the dirt to unloading position. When the hopper is full, load is dumped into a neat pile by means of one control. Sweeper controls are operated independently of truck controls for maximum flexibility.

5

New 2-Unit Crushing and Screening Plant

A new portable 2-unit crushing and screening plant has been developed by New Holland Manufacturing Co., Mountville, Pa. This one-man push-button controlled crushing unit on wheels has been fully field tested with excellent results, according to the manufacturer. Adaptable to either gravel crushing or quarry operations, the diesel power plant operates the 3030 double impeller breaker while an electric generator driven from the same diesel supplies power for driving the feeder, conveyers, screen and elevating wheel on the screening unit. Individual electric motor drives, controlled from the operator's platform on the crushing unit, eliminates chains, sprockets and counter shafts. The plant is capable of producing one-two-or-three products. Used in conjunction with the unit are portable conveyers for bin loading or stockpiling.

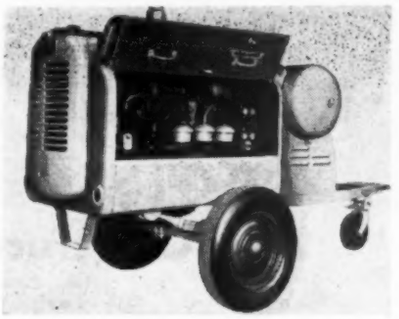


New crushing and screening plant

6

New Air Compressor

A new compressor, the "85" Airmaster, is now in production by Le Roi Co., Milwaukee, Wis. The power plant is the Le Roi Model D201 valve-in-head engine with replaceable cylinder sleeves, precision bearings, pressure lubrication and magneto ignition. The compressor, built integrally into the engine block is liquid cooled and also has pressure lubrication, replaceable cylinder sleeves, and precision bearings. Cylinder head and compressor valves are identical to those of their entire Airmaster series of portables. Compressor is regulated by the Le Roi patented Econotrol controlling compressor operation automatically according to the demand for air. Electric starting and the exclusive Electric hourmeter are supplied as standard equipment. The "85" is offered in a choice of two mountings, the type E shown here and also on hardwood skids type A. Full length tool boxes are standard with either type mounting.



Type E "85" Airmaster

7

New Portable Gravel Plant

A new portable gravel plant, the 34-S, has been added to the line of

GET INTO THE KING ROW
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MORE POWER • VERSATILITY
SPEED • ECONOMY

Compare these "KING-SIZE" features:
Full-revolving chain crowd fully enclosed steel cab air controlled steering all-welded, steel construction disc type clutches on swing internal-expansion, booster-type clutches on hoist and crowd all clutches easily adjusted and relined without removing shaft assemblies extra long crawlers and low center of gravity speedy, versatile and rugged!

Shovel made in ¾ yd. and ½ yd. sizes. Convertible to 4½ ton and 6½ ton cranes, respectively. Write for complete specifications, Dept. RS-97.

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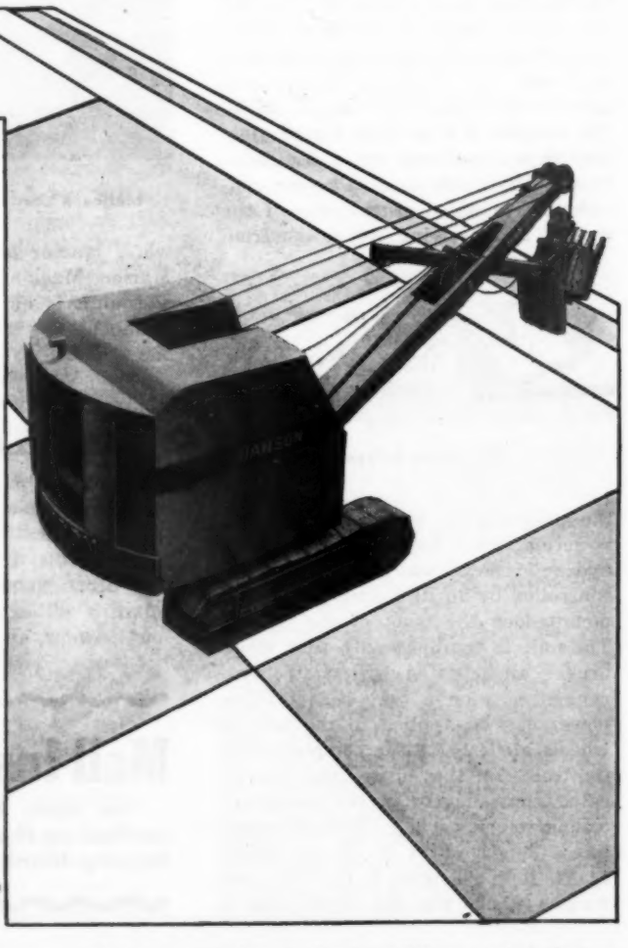

Your Latin American Ambassador for Equipment

CAMINOS Y CALLES goes as a goodwill builder for you to a special group of public officials, engineers, contractors and equipment distributors concerned with building, improveing and maintaining the highways of Latin America.

It is printed in Spanish with a section in Portuguese. Manufacturers of equipment and materials seeking an export market can reach the key buyers through CAMINOS Y CALLES without waste circulation. It is distributed to all Latin American countries and furnishes a CCA audit of 10,700 circulation.

Large credit balances have been built up in the U. S. by these Latin American countries. They are in need of all types of road building equipment—and they like it American made!

New — Catalog Issue

A new Reference and Data Catalog section will be incorporated in September 1947 issue of CAMINOS Y CALLES. This will give the manufacturer a place for his Catalog message to this specialized group—a year-'round-interest issue. Be sure to plan for this special issue in your 1947 budget.

●

Write for particulars on Caminos y Calles and on new Reference and Data issue.

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300 SERIES BODIES
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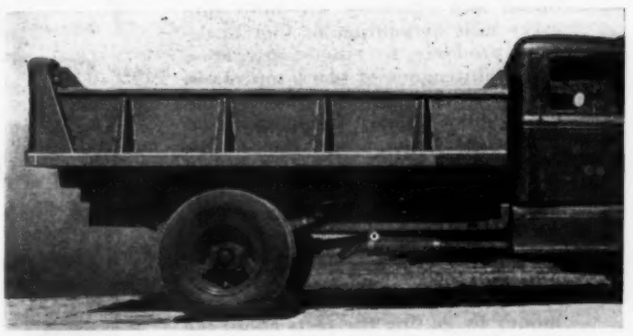

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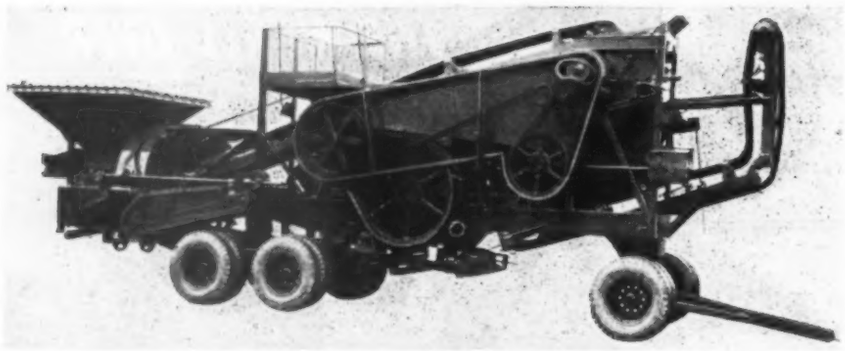
FOR ANY TRUCK STANDARD or SPECIAL UNITS IN ALL SIZES · FOR ANY USE



34-S Continuflo Portable Gravel Plant

Pioneer Engineering Works Inc., Minneapolis, Minn.. The 34-S meets state highway load limits for weight and dimensions. The total weight, less power unit is approximately 40,900 lb. It has a travel length of 41 ft. and a height of 12 ft. 9 in. The plant is equipped with six sets of dual 9:00 x 20 pneumatic tires. A 7 ft. hopper, equipped with mechanical feeder, takes the feed at the rear end of the plant. Processed material is delivered from the front end. Units consist of a 1024 jaw crusher with SKF bearings, a 24 in. x 16 in. roll crusher with Timken bearings, and a 3 ft. x 8 ft. 2½ in. deck vibrating screen, equipped with sand screen. Steel center cord V-belts drive the units from power mounted on the plant, or from an optional drive through a power take-off on a tractor. It is stated that only two men are required to operate the plant, one on the drag-line or shovel, the other on the plant itself.

8

New Moil Point

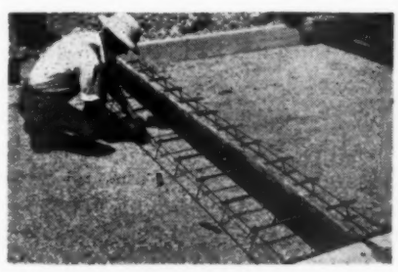
A new detachable moil point, added to the line of paving breaker tools of Rockbit Sales & Service Co., 2508 E. Cumberland St., Philadelphia 25, Pa., is forged of two different types of steel. The shank is described as made of "tough" steel for long life and the point is made of "hard" steel for cutting ability.

This moil point was tested on a recent street project and the company has announced that the new point broke 32 sq. yd. of concrete with one regrind. The job called for breaking up 14 in. concrete. It is stated that when the point wears out it can be detached and a new point placed on the same shank. The old point can be reground it is stated by any workman without old fashioned blacksmith resharpening.

9

New Highway Load Transfer Unit

A new plain dowel load transfer unit for pavement joints is now in production by Bethlehem Steel Co., Bethlehem, Pa. Balanced support of

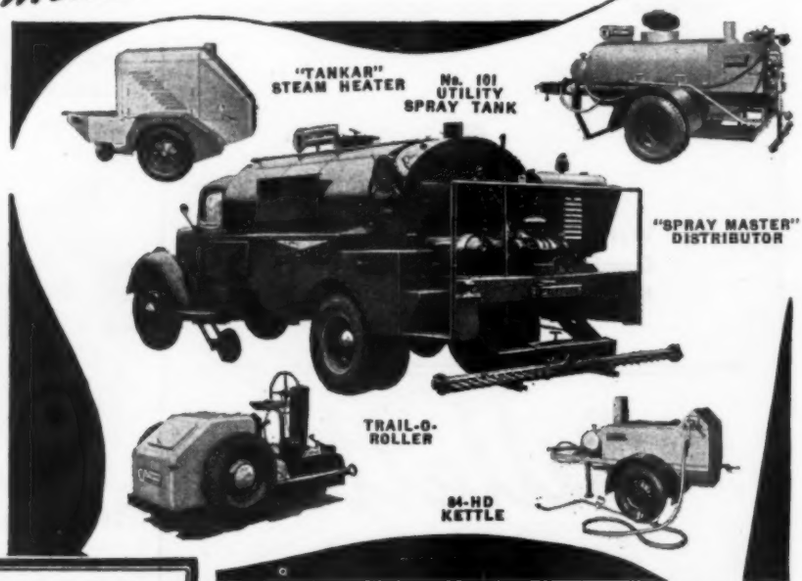


Fixing caps to slip, or free, ends of dowels during placing of recently perfected plain bar dowel load transfer unit

Roads Must Take a Beating
. . . but WHY SHOULD YOU?

LITTLEFORD SAVES YOU MONEY

Speed and efficiency are built into every unit of equipment that Littleford produces for the construction and maintenance of black top roads. From the big Spray Masters that lay it down in any width up to 24 feet, right through the line to the most expensive spray kettles, Littleford equipment moves faster, heats faster, operates faster. For almost fifty years Littleford has engineered and designed simplified units for every function in heating and application. Save yourself some money by getting the facts about the entire Littleford line. Write for Catalog W.



BLACK TOP ROAD MAINTENANCE EQUIPMENT LB SINCE · 1900
LITTLEFORD
LITTLEFORD BROS., Inc.
454 E. PEARL ST., CINCINNATI 2, OHIO

the dowels is provided in the new Bethlehem units by the simple division of the dowels into two groups. Alternate dowels along a unit are rigidly welded to one side frame and one center wire, while the remaining dowels are welded to the opposite side frame and center wire. This arrangement permits the two halves to be drawn apart for insertion of the filler strip. When the two halves are restored to their original position with the filler strip in between, the center wires, which are a distinctive feature of the Bethlehem unit, perform the important function of keeping the filler vertical at all times. The accuracy of control of dowel spacing and alignment in manufacture of these units contributes greatly to the ease of field assembly. Metal caps, or tubes, are provided to slip over the free ends of the dowels to permit their unrestricted movement in the concrete under expansion and contraction.

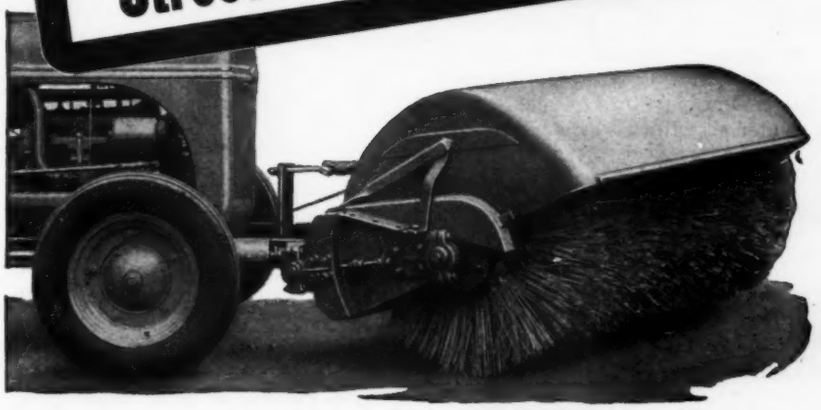
10
Mower, Snow Plow Combination

A rubber tired sickle bar type mower has been added to the line of James Cunningham, Son & Co., Rochester, N. Y. The company heretofore has supplied mowers with steel wheels only. Tire sizes on the new model are 4:00x12 in. At the same time, Cunningham has announced a

New Cunningham Mower

new snow plow attachment which can be mounted on the rubber tired mower. The mower has a 3-ft. cut, throttle control for variable speed, adjustable handles, and a 1½ h. p. Cunningham engine. The snow plow features a blade of 10 gauge steel, 40 in. wide and 14 in. deep. Through a quick-acting angle-shifting arrangement the blade can be angled up to 30° right or left. The snow plow is bal-

For Better Asphalt Paving . . .
For Removing Snow and Debris from
Streets-Alleys-Sidewalks



LITTLE GIANT POWER SWEEPER

Widely used for cleaning the street furnace before applying the seal coat in asphalt paving. Assures more permanent paving—helps eliminate bubbles or blisters. Also used for city clean-up work and snow removal.

For All Tractors, Jeeps
Little Giant Sweeper mounts on all tractors and Jeeps, normally requiring less than 90 minutes to attach. Operates from power take-off. Brush sets at 30 degree angle. Sweeps to right side of tractor, outside of wheel path. Sweeps against forward motion of tractor for increased efficiency. Dependable chain drive—all moving parts are scheduled for operator's protection.

Long-Wearing Brush—Dust Hood
Brush lengths of 5, 6, 7, 8 and 9 feet can be furnished. The 5-foot length is recommended for sidewalk snow sweeping. Long-wearing Palmyra brush fibre, refillable at nominal cost. Adjustable ground pressure—brush can be quickly set to fit all sweeping conditions.
Dust hood helps keep tractor clean—assures clear vision for operator. Hood can be removed in 15 minutes for sweeping snow.

Little Giant gets the sweeping job done faster. It quickly pays for itself in labor saved. The initial investment is low—very little upkeep expense. Can be used year-round—for snow in the winter and rubbish the rest of the year. Designed by experts with years of experience in the sweeping field. Widely used by municipalities, airports, road contractors and industrial concerns.
We are in production and can make prompt delivery. Let us send you complete information and prices. Write

LITTLE GIANT PRODUCTS, INC.
1581 N. ADAMS ST.
PEORIA 3, ILLINOIS

anced for easy operation and can be attached or detached quickly.

11

New Truck-Mounted Loader

Increased speed and ease of maneuvering result from new features incorporated in the new Model 400 Eagle truck mounted loader of Eagle Crusher Co., Inc., Galion, O. Four new features are: Full hydraulic control operated from operators platform just behind truck cab; lower overhead clearance, overall height 11 ft. 10 in.; speedy discharge by conveyor belt operating on a 180 degree radius and capable of discharging wet material without depending on

Model 400 Eagle Truck-Mounted Loader

gravity flow; and positive crowd. The Model 400 is stated to have a 3 to 5 yd. per minute capacity. Approximate weight complete 11,500 lb. The loader mounts on any new or used 1½ or 2-ton truck. Power is supplied by the truck engine through a power take-off from the transmission. A governor provides uniform motor speed.

12

New Electric Chain Saw

A new one-man high-cycle electric chain saw announced by Homelite Corporation, Port Chester, N. Y., weighs only 27 lb., complete. This new chain saw is easily handled by one man, for felling, limbing or bucking trees or for accurately cutting timbers up to 20 in. The electric power for the saw is furnished by a Homelite High-Cycle generator driven by an integral gasoline engine—a compact lightweight generator which can be carried to any location. Homelite carryable 180-cycle generators are available in two sizes. The Model 24A230/180 has a rated capacity of 2500 watts, and weighs only 129 lbs. complete with engine. The Model 25A230/180 has a rated capacity of 5000 watts, and weighs only 171 lbs. The Model 24A230/180 generator operates one high-cycle chain saw and the Model 25A230/180 generator will operate two. Either generator can be used to operate other types of high-cycle electric tools.

One-man electric chain saw

13

New Concrete Vibrator

A new heavy duty concrete vibrator has been brought out by Aristo Power Tools, Inc., Chicago, Ill. An automatic clutch which engages at an engine speed of 1750 rpm. provides

You Can't Beat Welded Construction
WELLMAN
Williams Type BUCKETS
• Wellman pioneered welded rolled steel construction for longer life and greater service. It's the extra strength that gives the extra, low-cost digging power. Whatever your requirements . . . whether for Multiple Rope, Power Arm, Dragline, Power Wheel or Special Service—specify Wellman!
⅜ to 16½ yd. capacity.
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THE WELLMAN ENGINEERING COMPANY
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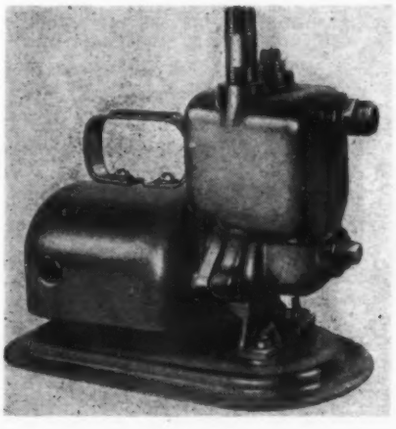
smooth operation. The engine is a 4 h.p. air-cooled Wisconsin. The flexible shaft has a ½-in. core of stranded music wire. The vibrating head has two single rows of anti-friction ball bearings at each end of the rotor shaft and a single ball thrust bearing in the head for longer life. Engine swivels independently of the stand, which has rubber-grip wheelbarrow handles and is equipped with a puncture-proof rubber tire. The jackshaft is a heavy duty member, equipped with two double row radial thrust ball bearings. A positive lock is provided for belt adjustment. The drive is a twin V-belt with belt guard. Vibrating speed is 8,000 rpm.

14

New Lightweight Pump

A 20 lb. self-priming Multipurpose pump is the latest development of The Gorman-Rupp Co., Mansfield, O. Among the many uses claimed for this pump are sprinking of lawns and gardens from cisterns or lakes, dewatering basements, pumping out boats, car washing, emergency fire fighting, pest control, a standby



The "Handy Pump"

pump, etc. Use of an aluminum volute, and dimensions of only 15¾ in. length, 7 in. width and 15¼ in. height contribute to the extreme lightness of the total unit. Versatility is increased by the use of suction and control ports that fit common pipe or garden hose adaptors, making the pump ready for instant use. A Lamb electric ½ hp, self-lubricating, ball bearing, universal type motor, drives the pump, which will lift up to 25 ft. and deliver 8 gals. per minute at 40 lb. pressure. It plugs into any light socket and operates on AC current of 60 cycles or less or DC.

15

Solvent for Removing Gum

A new powerful and quick-acting

FOR 10 TO 60 TON LOADS

W-W Low-bed with 15 ton dragline working from bed.

These adaptable low-beds are the answer to every heavy hauling need. Available in semi or full models, W-W Lowbeds serve construction contractors, heavy hauling firms, County and State Highway Departments, industrial firms and Federal Government agencies.

10-15 TON MODELS are available in full and semi trailer types. Strong unit frame and gooseneck, heavy duty wheels and axles . . . and standard equipment air brakes give complete adaptability to any hauling problem that seldom exceeds 15 ton.

20-35 TON MODELS are available in both full and semi models. These standard 20 ton types double carrying capacity by the adding of 8 extra tires. Available in tandem bogie axle types with or without loading ramps.

IMMEDIATE DELIVERY on any standard 10-15 and 20-35 ton models.

40 to 60 ton models are custom built to meet any specific hauling problem. Prices and delivery date on request.

FREE CATALOG on request. Tell us type and capacity desired on coupon below, attach to your letterhead and MAIL TODAY.

The WINTER-WEISS Co.

2201 Blake St. **Denver 2, Colorado**

Gentlemen: Please send pictures and complete data on your dependable lowbeds. We are particularly interested in a____ton capacity with loading deck length of____ ft. from gooseneck to front of rear tires.

*Firm Name*_____

*Address*_____

*City*_____ *Zone*____ *State*_____

*By*_____ *Title*_____

Haul SMALL OR MEDIUM EQUIPMENT with your DUMP TRUCK

on the ROGERS "TAGALONG" FRONT LOADER

AVAILABLE IN 10 TO 20 TON CAPACITIES

With the new Rogers "Tagalong" trailer a dumptruck serves as the tractor to haul light and medium equipment, and one driver handles both jobs.

Your overhead is kept to a minimum. Hauling charges and costly delays are eliminated with the "Tagalong".

Write for prices and additional information on this versatile trailer which will save its purchase price in a remarkably short time. PATENTS PENDING.

EXPERIENCE builds 'em • PERFORMANCE sells 'em

ROGERS HEAVY DUTY Gooseneck Trailers

ROGERS BROTHERS CORPORATION

DESIGNERS and BUILDERS of HEAVY DUTY TRAILERS SINCE 1915

135 ORCHARD ST. ALBION, PENNA.

FASTER LOADING, LIFTING, SCRAPING

"The Ottawa" Industrial Hydraulic Front End Loader saves hundreds of man hours on every job. A rugged heavy duty attachment for industrial type tractors that loads bulk materials, does light bulldozing jobs and operates as a portable crane. A year 'round labor saver—will do hundreds of odd jobs better faster. Handles loads up to 4,000 pounds, lifts to a height of 9½ feet. It is shipped complete with super-powered Hydraulic system. Bulldozer, Boom and Snow Plow attachment available to give you maximum productive use of your industrial tractor. Hundreds now in use by contractors, quarries, building material and coal dealers and municipalities.

Write today for prices and illustrated bulletin. Immediate shipment. Fits most models industrial tractors.

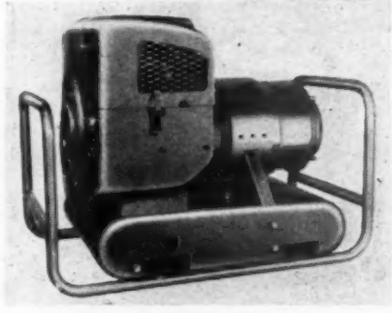
Ottawa STEEL PRODUCTS, Inc.
INDUSTRIAL DIVISION
OTTAWA, KANSAS • U. S. A.

liquid solvent for removing gum accumulations in fuel lines and in carburetor jets and passages is a recent product of the Pennsylvania Refining Co., Cleveland, O. One pint of Gumout added to 10 gallons of gasoline is said to completely dissolve carburetor gum, lacquer, and varnish; cleaning the entire fuel system while equipment is in operation. It is claimed that regular applications into the gasoline tank will keep engines clean of gum. The solvent also is claimed to eliminate water trouble and prevent ice formation in the fuel system. Direct application of the solvent in the combustion chambers will loosen sticky valves and rings. The product is packaged in 1 pint bottles, 1 and 2 gal. cans, 5 gal. pails, and drums.

16

New Electric Plant

A 5000-watt electric plant weighing only 272 lb., known as the 5CK-115M, has been announced by D. W. Onan & Sons, Inc., Minneapolis, Minn. This model is one of a new, improved group of plants employing the new Onan "CK" air-cooled, 4 cycle 2-cylinder gasoline engine as a prime



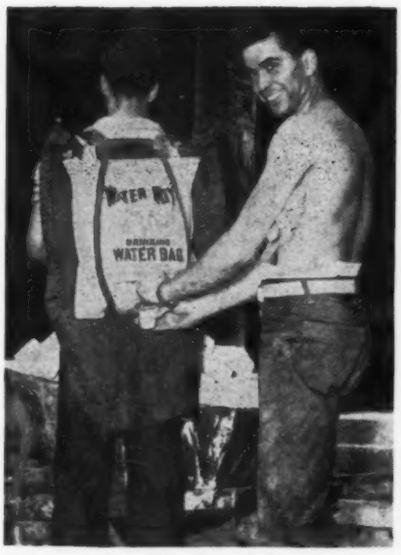
Model 5CK-115M

mover. The 5CK-115R weighs only 54.2 lb. per thousand watts, while the pounds-per-watts vary slightly for the other models in the group. It is stated the new plants will produce about 1 kilowatt hour of electricity per quart of gasoline.

17

New Canvas Water Bag

A new type large size canvas water bag for carrying drinking water to construction jobs has been announced by the H. Wenzel Tent & Duck Co., St. Louis, Mo. Called the "Water Boy," this new drinking water bag has a complete shoulder harness and apron which straps to the back of a water carrier, enabling him to climb ladders and "make the rounds" wherever men are working, thereby eliminating the necessity of men leaving

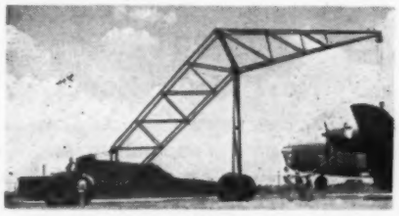


The "Water Boy"

the job. It is equipped with a sanitary chrome spigot at the bottom which can be used either as a faucet to fill cups, or can be turned up and used as a bubbling fountain. Made of heavy canvas, it allows water to slowly seep through, and be evaporated by the air, thereby keeping the drinking water inside the bag cool and fresh throughout the day. This new drinking water bag holds 5 gal., and when not being carried, apron and harness can be removed, and the bag hung nearby for use by a group of men or transported on the side of a truck.

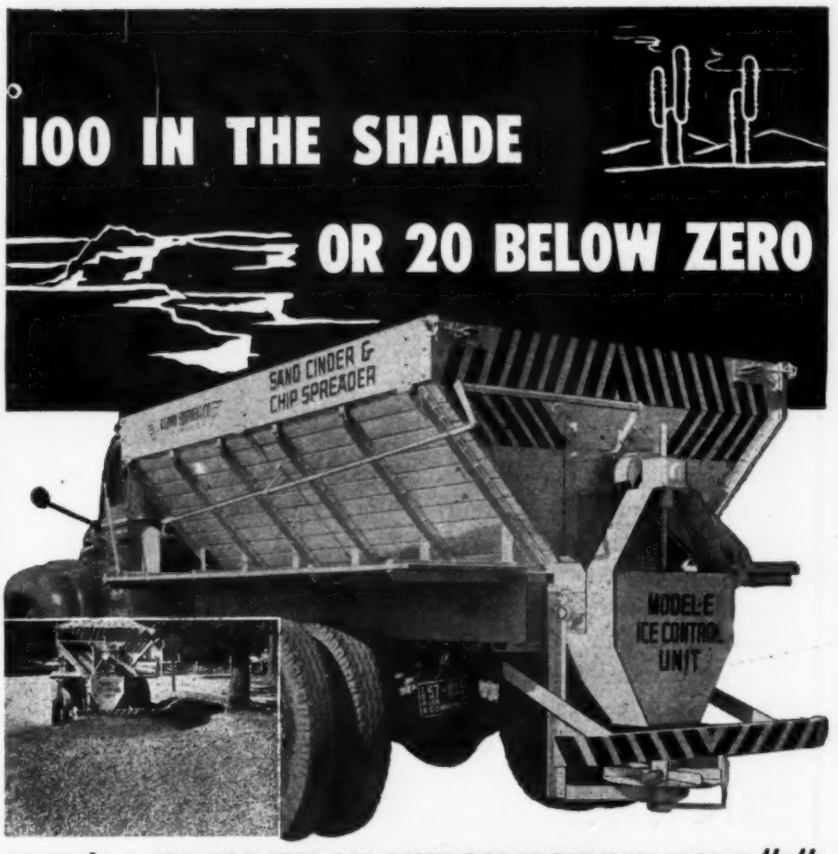
18 New Electrically Powered Crane

A new electrically powered crane, announced by R. G. LeTourneau, Inc., Peoria, Ill., requires no outrigging or end jacks. The crane is a one-man operated machine, all operations being controlled by push buttons located on the instrument panel. The crane is powered by three electric motors fed by a high-capacity generator



30-Ton Tournacrane

mounted in line with the engine. One motor raises and lowers the pulley block, one raises and lowers the boom and another determines the angle of the boom track. Still another electric motor is used for positive steering of the Tournapull. Featured in the line



THERE'S A JOB FOR THE ALL-PURPOSE HIGHWAY MODEL "E"

● Spreading sand and cinders for ice control on streets, highways airport runways, etc. ● Spreading calcium chloride for dust control on secondary roads, parking lots, airports, fair grounds, etc. ● For seal coat work, spreading chips, sand, etc., over newly laid oil or blacktop ● Patch work spreading ● Spreading commercial fertilizers in parks, on lawns ● Hauling crushed rock and chips ● General road and shoulder maintenance

14 OUTSTANDING FEATURES THAT SAVE TIME, MATERIAL AND MONEY

1. Uniform spread at all speeds.
2. Covers 2 or 4 lane highway in one operation.
3. Spreads material on highway where needed. No material wasted on shoulders.
4. Operates forward or reverse.
5. Spreads to right, to left, or both sides as desired.
6. Material is cast low to ground—no interference with traffic.
7. Spread may be started or stopped with truck in motion.
8. All controls within easy reach of driver's seat—one-man operation.
9. Material is also spread ahead of rear wheels of truck assuring traction and safety at all operating speeds.
10. Electrically welded all steel frame.
11. Wooden hopper eliminates corrosion from chlorides, assures longer life; also wet material won't freeze to sides in cold weather as is often the case with a steel hopper.
12. Ball bearing gear boxes, oil tight, dust and water proof.
13. Self-unloading 24" wide conveyor assures steady material flow.
14. Hopper sides hinged for easier hand loading.

The Highway Model "E" Spreader is made in 9, 11, 13 and 15 ft. lengths—easily mounted on any standard truck chassis. Other lengths made on special order. Write for literature—today.

●

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LEADING CONSTRUCTION MACHINERY DEALERS THROUGHOUT
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MANUFACTURERS OF THE WORLD'S MOST COMPLETE LINE OF SPREADERS

KINNEY
BITUMINOUS DISTRIBUTORS
ENGINEERED TO AVOID WASTE —SAVE MONEY

The Kinney Distributor is an extremely economical and profitable machine. A simple three-way valve controls loading, circulating and spraying — provides instant starting. The large handwheel controls wide lateral movement of spray bar for exact register at road edges or successive strips. The high capacity Kinney Rotating Plunger Pump is accurate as a meter and applies all grades of bitumen uniformly in exact quantity specified. The Kinney Distributor shown is applying a surface treatment at exactly 0.5 gal. per sq. yd. — note the uniform application and close matching of strips.

Write for Bulletin.

KINNEY MANUFACTURING COMPANY
3537 Washington St., Boston 30, Mass.
We also manufacture Vacuum Pumps, Liquid Pumps and Clutches.

New **HEAVY-DUTY ELECTRIC PLANT**

5CK-115M
$545.00
FOB MINNEAPOLIS

5000 WATTS

Only 272 lbs!

• Large capacity, compact design, and lightweight aluminum construction are combined in this new, rugged, portable electric plant. Easily carried by two men. Powered by Onan 10 HP horizontally-opposed, two-cylinder, 4-cycle, air-cooled engine. Unusual operating economy. Shipped complete, equipped with four-receptacle outlet box and mounted in tubular-steel guard frame.

NEW ONAN CK ELECTRIC PLANTS *are available in 5,000 Watts D.C., 115 and 230 volts; 2000 and 3000 Watts A.C. in all standard voltages.*

ONAN ELECTRIC PLANTS—*A.C.: 350 to 35,000 Watts in all standard voltages and frequencies. D.C.: 600 to 15,000 Watts, 115 and 230 Volts. Battery Chargers: 500 to 6,000 Watts, 6, 12, 32 and 115 Volts.*

ONAN AIR-COOLED ENGINES—*CK: 2-cylinder opposed, 10 HP. BH: 2-cylinder opposed, 5.5 HP. IB: 1-cylinder, 3.25 HP.*

Onan PRODUCTS

Write for Catalog

D. W. ONAN & SONS INC.
2820 Royalston Ave., Minneapolis 5, Minn.

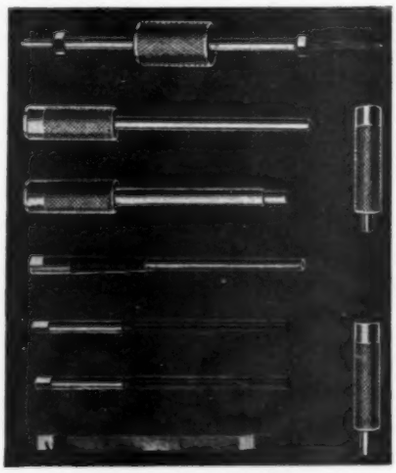
ONAN ELECTRIC PLANTS

of LeTourneau Cranes is the 15-ton Tournacrane with C-10 Tournapull. This new unit has a maximum height of lift of approximately 30 ft., and a maximum reach of approximately 26 ft. behind the rear axle. The lift can easily be increased over 16 ft. more by the addition of a simple boom extension. These cranes will travel, loaded or empty, at speeds over 20 m.p.h., on or off the pavement. Both crane and Tournapull will weigh in the neighborhood of 28,500 lb.

19

New Carburetor Service Set

A new and complete carburetor service set for John Deere carburetors has been announced by Owatonna Tool Co., Owatonna, Minn. The set is made up of the tools shown in the accompanying illustration, all of which were developed in cooperation with the



Carburetor Service Set

John Deere service department. The set includes all the necessary tools for servicing the A, B, G, GM, D and H carburetors. The set can be purchased in a compact metal case which contains all the tools and which reduces the danger of losing any of the parts.

20

New Clevis Hook

Featuring unusual speed of attachment and maximum safety, a newly developed clevis hook has been added to the line of The Thomas Laughlin Co., Portland, Me. The clevis design, utilizing a bolt, slotted nut and cotter pin for fastening, makes it easy to attach the hook and switch from one job to another, yet meet all safety requirements. No welding, machining or threading are necessary to attach this hook. The hook can be supplied with the Laugh-

Laughlin Clevis Hook

lin safety latch, or with reversed jaw, on special order. It is made in four of the most popular hook sizes, 1½, 2, 3 and 5 tons, and all parts, including bolts, are of drop-forged, heat-treated steel.

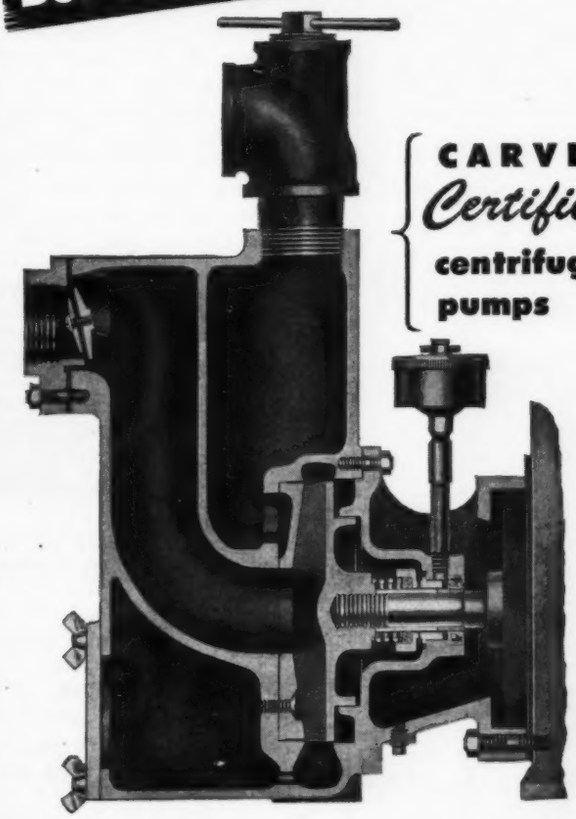
21
New Lift Truck

A heavy duty lift truck embodying a radically different design is now in production at Mixermobile Manufacturers', Portland, Ore., plant. The main feature of this new type lift truck is the hydraulic lift that will handle 6000 lb. to a height of 8 ft., or 4000 lb. to 11 ft., yet collapse completely into the truck body. With the lift in lowered position there is no track or front obstruction to prevent

Wagnermobile Lift

the lift from passing under low head clearance. The lift weighs 7425 lb. with fork and boom. A variety of quick-change attachments are available making possible the handling

Here's the Inside Story of Better Pumping Performance



CARVER Certified centrifugal pumps

★ High Capacity at high suction lift.

★ High Efficiency at high pressures and at slow speeds.

★ Non-Recirculating—no priming gadgets.

★ Life-Time Seal — wearing surfaces are almost diamond-hard.

★ Fewer Working Parts because of simple design.

★ Non-Clogging — streamlined design.

★ Performance of each pump is *certified*.

Capacities from 3000 to 200,000 GPH. Sizes 1½" to 10". Ask for Bulletin 101-A. Carver Pump Co., 1056 Hershey Ave., Muscatine, Iowa.

CARVER PUMPS Muscatine Iowa

IT'S POWERFUL
IT'S SELF-CONTAINED

THE
SYNTRON
Gasoline Hammer
PAVING
BREAKER

Will Save You Money and Time

BUSTING
CUTTING
DIGGING
TAMPING
and a host of other jobs.

100% Self-Contained
No Compressor, No Hose
No Battery Box, No Cable

Write for illustrated folder.

SYNTRON CO.
384 Lexington, Homer City, Pa.

of a wide variety of heavy or bulky materials. Attachments include forks to handle pallets, lumber, etc., and "scoop" type buckets in both ½ yd. and ¾ yd. capacities.

22
New Spreader and Dump Body

A double duty dump body which can be used for gravel hauling and dumping as well as for spreading lime, has been placed on the market by Weston Dump Body Co., Des Moines, Ia. When used for lime-spreading, a 20-in. wide drag-chain conveyor carries the lime onto a 21-in. distributor fan. Heart of the

New Weston Dump Body with Cone-Drive Speed Reducer shown in foreground

operating mechanism is a cone-drive speed reducer, designed and produced by Cone-Drive Division, Michigan Tool Co., Detroit, Mich. It is used for transmitting power from the power take-off shaft to the drag-chain conveyor and is of the pinion-under type with a 30:1 reduction. The dump bodies are available in 9 ft., 11 ft., and 13 ft. lengths. Dump gates in the bottom of the body open to a width of 5½ in., to allow rock and gravel to drop freely when using the truck for gravel hauling. Two levers operate these gates, the left-hand lever tripping the center gates to drop the load and the right-hand lever closing and locking the dump gates.

23
New Chemical for Weed Control

Several experiments are being conducted in the Middlewest by Howard Hanson & Co., agricultural chemicals, Beloit, Wis., with a new chemical said to have the reverse action of 2-4D. It is reported by experiment stations to have a herbicidal effect on the grasses, killing quack, Johnson grass, etc., so that even the seeds from these plants when sown later will not germinate. Application is made to the soil instead of the aerial portion of plants. The chemical will be available as soon as experiments permit.

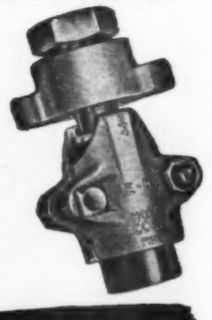
LE-HI
HOSE COUPLINGS

LE-HI Series 150-B
The Universal Type Hose Coupling with the patented "Safety-Locking" feature that positively prevents accidental uncoupling. Especially designed for compressed air service.

CAN TAKE IT!

LE-HI Series 400
The ideal "all-purpose" coupling for heavy-duty, high-pressure service. For air, water, steam, etc. Extra heavy construction for maximum safety, efficiency and service life.

LE-HI Series 300
A tough, sturdy coupling designed especially for use with jack hammers, tampers, rock drills, sinkers, etc. Corrugated-shank stem has collar to engage front lug of high-pressure clamp for extra protection against leakage or "blow-offs."



LE-HI MAKES A GOOD CONNECTION!

Go to your local distributor for these rugged, economical LE-HI Hose Couplings — NEVER SOLD DIRECT.

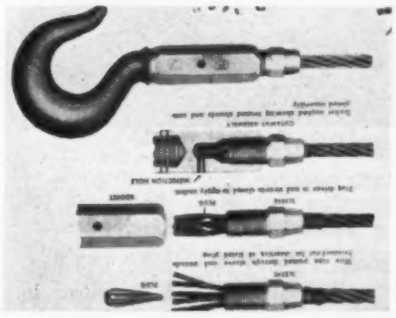
LE-HI HIGH and LOW PRESSURE HOSE COUPLINGS

HOSE ACCESSORIES CO.
2762 North 17th Street
rnitadelphia 32, Pennsylvania

24

New Wire Rope Hook-End Fitting

A new hook-end fitting has been introduced by the Electroline Co., Chicago, Ill. This patented Electroline-Fiege connector is built as an integral part of the hook. Applied with common tools and easily checked through an inspection hole, the



Installation of Fiege Connector

manufacturers claim that the assembly will stay on forever or can be easily removed if desired. A vibration damping effect prolongs the life of the wire rope eliminating the need of frequent re-socketing. The forged steel hook is available in stationary or swivel types for ten wire rope sizes between 1/4 in. and 1 in. inclusive.

MANUFACTURERS' LITERATURE

25

Heavy-Duty Diesels

Four heavy-duty diesel engines ranging in size from 180 to 300 HP are described and illustrated in a new 16-page, three color booklet, Bulletin No. 1332, issued by The Buda Co., Harvey, Ill. The bulletin gives construction features, details regarding combustion, installation and design as well as many illustrations of actual installations of Buda engines being used in all types and kinds of haulage equipment.

26

Snow Clearing Operations

A booklet issued by Caterpillar Tractor Co., Peoria, Ill., shows "Caterpillar" diesel tractors and motor graders at work with V-type and one-way snow plows, snow wings and tractor-mounted loaders opening the way for ground and air transportation in the city and rural communities.

JACKSON

MUNICIPAL PAVING UNIT

Knocks the Socks off **PAVING COSTS!**

This revolutionary new development in Municipal Paving Units has definitely proved that it can place perfectly upwards of 65 cubic yards of concrete in a single hour!

FURTHERMORE, IT EMPLOYS THE ONLY SCREED THAT WILL:

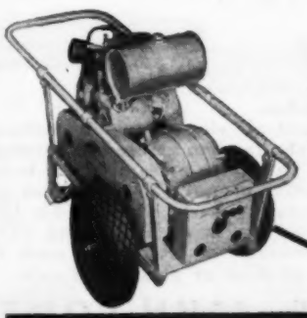
1. Undercut at side forms,
2. Roll back for second pass.
3. Strike-off crowns, both regular and inverted.
4. Permit operators to work from front, rear or sides.

In addition, the screed has such a strong tendency to propel itself in the forward direction that only small effort is necessary to strike-off stiff mixes of concrete. Manholes and storm sewers are no handicap due to the fact the screed does not reciprocate. Does an excellent job of vibrating concrete in slab depths up to 10 inches. Can be used to great advantage on any slab width from 5' on up to any practicable width. For radically reduced costs and far greater production, by all means write for complete details of this remarkable paving unit RIGHT NOW!

The COMPLETE UNIT CONSISTS OF:

1 The Model SC200 Screed (for slabs up to 16' wide) or Model SC202 (for slab widths from 16' and up) — activated by the famous JACKSON Vibratory motor. Light weight, easily transported — quickly converted from one slab width to another.

2 One of our famous Portable Power Plants which provide a wide range of vibratory frequencies thus assuring perfect placement of any concrete mix usually specified. These husky plants are Wisconsin engine powered and have permanent magnet generators which require no adjustment or maintenance.



MODEL M-1 POWER PLANT

furnished with Model SC200 Screed. Capacity: 1.25 K.V.A. Generates both single phase and 3-phase 110 Volt 60 Cycle AC. Also ideal for operating lights, vibrators and powers tools.

ELECTRIC TAMPER & EQUIPMENT CO.
LUDINGTON MICHIGAN

Get a Line on an Owen!

OWEN CLAMSHELL BUCKETS INSURE A BIGGER DAY'S WORK

with a MOUTHFUL AT EVERY BITE

For faster digging, ease of handling on difficult jobs and lowered operating costs, "get a line on an Owen Bucket".

Owen designs and builds to meet your every general or specific requirement.

The workings of an improvement-conscious engineering department are evidenced in field performance everywhere on dredging, excavating and material handling jobs.

Write FOR THE NEW CATALOG

The OWEN BUCKET CO. 6070 BREAKWATER AVE. CLEVELAND, OHIO BRANCHES: New York, Philadelphia Chicago, Berkeley, Calif.

27
Stationary Diesel Engines

All models of the stationary diesel engines of the Superior Engine Division, The National Supply Co., Springfield, O., are described in a new 28-page bulletin issued by the Division. The bulletin describes and illustrates how the diesels are designed and built. It carries 46 photographs, 8 performance charts, standard and special equipment tables and 5 dimensional blueprints including foundation sizes and amount of concrete required. Horsepower ratings and specifications are given for all engines, both supercharged and non-supercharged.

28
Tandem Roller

The 3 to 4-ton tandem roller of the Wheeler Tandem Roller Division of Shaw Sales & Service, Los Angeles, Calif., is pictured and described in a folder. This variable weight roller features simple and efficient operation. A single lever clutch and shift is provided which alone will move the machine forward or backward. Featured is a one-lever steering control which easily maneuvers the machine by the new hydraulic steering lever or an easy operating hand wheel.

29
Welding Rods

The current issue of the "Eutectic Welder," published by the Eutectic Welding Alloys Corporation, New York, N. Y., is entirely given over to the new Eutectic development, "Ready-Flux-Coated" EutecRods for gas welding.

30
Trencher

Parsons 200 wheel trenchliner, the new pipeline and drainage trencher of the Parsons Co., Koehring subsidiary at Newton, Ia., is completely described in a new illustrated bulletin. Thirty action pictures, detail photos and drawings show and explain features like the pivot wheel mounting and the new tile chute. Parsons simple direct power flow and the advantages of enclosed gearing are graphically illustrated. Specifications are included in the bulletin.

31
Hoists and Bodies

Medium heavy duty hoists and bodies are illustrated and described in a folder issued by St. Paul Hydraulic Hoist Division, Gar Woods Industries, Minneapolis, Minn. Operation of St. Paul's Model 7 Hoist and its construction features are explained. This literature also shows St. Paul steel dump bodies in various styles. Both 10 gauge (medium heavy duty) and 8 gauge (extra heavy duty) bodies are illustrated.

32
Plaster-Mortar Mixer

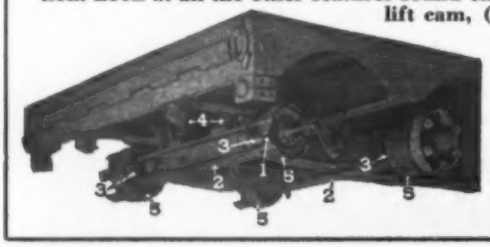
A profit-building tool for small and large plaster and mason contractors, the Kwik-Mix 6-P plaster-mortar mixer, is described in a new illustrated bulletin published by the Kwik-Mix Co., Koehring subsidiary, Port Washington, Wis.

33
Angling Blade Bulldozers

Basic specifications and production features of the new cable controlled angling blade bulldozers—the No. 8A

BE SURE YOUR NEXT TRAILER HAS *ALL* THESE FEATURES

● Deep, wide flange main beams running the full length of the trailer, I-Beam sections for cross-members and outriggers, improved, fabricated gooseneck, and all electric-welded construction. Look at all the other features found only on Jahn tandem axles: (1) constant lift cam, (2) two full-width axles attached to longitudinal rocker beams, (3) worm gear type slack adjusters at each wheel, (4) heavy coil springs at each axle and (5) positive equalizing braking at each wheel regardless of position of axle.



C. R. JAHN COMPANY

DEPT. 1345, 1106 W. 35TH STREET, CHICAGO 9, ILL.

JAHN TRAILERS ALL OVER THE WORLD!

Heavy duty trailers from 5 to 100 tons.

and No. 7A—are stressed in an 8-page booklet issued by Caterpillar Tractor Co., Peoria, Ill. The booklet outlines the structural advantages of the bulldozers which are designed for use with the "Caterpillar" Diesel D8 and D7 track-type tractors. It also emphasizes and illustrates, with model and cutaway views, blade C-frame, brace, sheave, and push cup construction and angling, tilting and lifting adjustments possible. Several job scenes of angling blade bulldozers are shown.

•

(*Continued from page* 87)

Highway Engineers Must Gear Up Public Relation

in Congress recently by some groups for repeal of all federal automotive excise taxes, including the federal gasoline tax. A spokesman for one group said recently that "the whole structure of automobile taxes is in danger of breaking down and toppling with it the entire system of finance and administration for the simple reason that all units of government are apparently now regarding all automobile ownership as a measure of taxability." He said that the "federal automobile taxes are unfair and discriminatory. They are taxes upon the necessities of life. They are regressive in that they result in multiple taxation and they endanger state tax structures."

I might add also that they bear rather heavily, but in the opinion of some, not heavily enough, on the "for hire" operators on the highway system.

The total average gasoline tax paid by the automobile owner approximates 14 cents per day. For the price of a pack of cigarettes per day, he provides the great bulk of the funds which pay for construction and maintenance of our highway system, largely for its policing for the safety devices built into it, and for facilities in general provided for his safe transport everywhere. Of course, the amount so paid is considerably more for the large semi-trailer, full-trailer freight trains that operate over the public highways.

It was said further that "one concrete example of the extent of the current demoralization is the large scale demand for toll roads that has appeared in many parts of the nation. This cry for toll roads will continue to be heard, with its unfortunate impacts on the future of highway transportation, until the *states* set their financial houses in order. This cannot be done so long as the Federal government and the counties and the municipalities are vying with each other to *mulct* the motor vehicle owner."

It is the important and vital task of the highway official to explain to the public, if any "mulcting" is going on, just who is mulcting whom, and this can be done effectively only with a public relations department that writes interesting, accurate, and informative statements and disseminates them through appropriate media.

Awakening and maintaining public interest and support of the highway departments' plans and program is essential to our progress and can be attained only by the establishment of a capable public relations organization.

•

(*Continued from page* 104)

Heard at ARBA's New England Equipment Conference

as increasing the quantity laid per hour.

The advantages of various types of rollers with respect to rolling bituminous concrete surfacing were discussed, after which it appeared to be the consensus of opinion that each type does a satisfactory job of com-

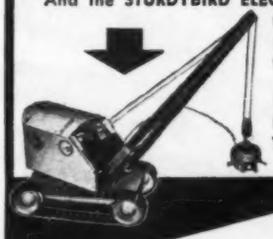
"I'M JACK DOUGLAS . . . the fellow you didn't expect to see here . . . and I make these Sturdybird construction toys. They're the real thing in miniature and good . . . like the big equipment they're patterned after.

I've been thinking what I'd do if I was in the construction business in a big way and I wanted to remember my customers' kids at Christmas. I'd give 'em these Sturdybirds! Boy, wouldn't a real construction-minded youngster go for that!

And it wouldn't take his dad's mind off the fact that I've got some real equipment myself that should be working for him. How's that for a hint? I'll take your check and send your customer the best boy's Christmas present of all time."

And the STURDYBIRD ELECTRO-MAGNETIC HOIST. Built big and strong like the Sturdybird Crane. Battery powered steel-cased magnet lifts 10 lbs. Drops the load at a flick of the switch! $10.00 express prepaid.

MATCHED SET of both Sturdybirds . . . $18.50 express prepaid. They'll both keep Christmas alive all year!



STURDYBIRD CRANE

Powerful clamshell bucket, boom hoists and lowers, cab swivels to any position, wide moulded rubber treads, honest-to-goodness welded steel construction . . . a big heavy job 31 inches long, in bright play colors.

$8.50 Express Prepaid

"NOW, HERE'S SOMETHING SPECIAL! On all orders for one dozen Sturdybirds, or more, I'll stencil your Company's name right on the toys where it won't be overlooked! That's what I call an on-the-job 'silent salesman'! I'll take the whole problem off your hands, ship right to your customers' homes, and you'll be known as the 'stand-out' Santa Claus of the year"!

Jack Douglas,
TECH-ART, INC., MILFORD 7, OHIO:
Here's our order for Christmas Sturdybirds . . .

☐ (Quantity) Sturdybird Cranes at $8.50 each, express prepaid;
☐ (Quantity) Sturdybird Electro-Magnetic Hoists at $10.00 each, express prepaid;
☐ (Quantity) Matched Sets of both Sturdybirds at $18.50, express prepaid.
(Ohio residents only add 3% Ohio Sales Tax)
☐ Ship to us. ☐ Ship to attached customer address list.

NAME.....
COMPANY.....
ADDRESS.....
CITY.....STATE.....
COMPANY NAME TO BE STENCILED ON TOYS (Print)
.....

pressing the bituminous concrete under ordinary conditions.

Other items of equipment discussed during this meeting included stone spreaders, tank car heaters, distributors, graders, honers, and heating kettles.

Remarks and Instructions

The Association's manual also includes the following comment:

Tabulate costs for year on Form No. 3.

Form No. 4 is the complete record of a piece of equipment. The front page contains all the vital information relating to the equipment. The reverse side of sheet is for tabulating the yearly expense of maintenance and operation over the life of the equipment. This is posted from Form No. 3.

All equipment should be identified by stenciling a number on same in some conspicuous place.

Costs should not be kept on small pieces of equipment such as wheelbarrows, tools, etc. They should be charged directly to construction or maintenance at time of purchase or when requisitioned from stock. Generally, such items costing under one hundred dollars should be disposed of in this way.

A great deal of detail is eliminated by grouping small equipment, such as sand spreaders for ice control, snow plows, truck scrapers and mowers. One account for all such equipment contained in a group, to correspond with Classification of Equipment, is sufficient.

The depreciation table set up provides for replacement of equipment in eight years outside of light trucks, automobiles, pickups and panels. Further studies of depreciation will be made as there may be special pieces of equipment that will justify a revision.

Equipment rental should be charged against operations in the same manner as labor. The credit should be posted to account in General Ledger labelled "Equipment Rental." The difference between controlling accounts "Equipment Expense" and "Equipment Rental" indicates whether proper rental rates are being used.

●

(*Continued from page* 69)

"Egg Roller" . . . Cuts Cost of Asphalt Paved Ditch

enough to do a rolling job, or, when empty, light enough to lift onto the truck and be carried around. The "egg" roller was attached to the front of a broom so the ditch could be rolled and broomed at the same time.

The spreader box is also attached to standard equipment and swings over the ditch. The flow of material from it can be regulated by a shutter to control the amount of cover stone and pea gravel.

Company officials feel that the foregoing outfit should prove in every way practical for suburban areas. It is effective and economical. The time saved alone, in the face of a bad season of weather, has been a substantial advantage. Five miles of curb and gutter would ordinarily take a month to put in, whereas with this type of gutter the job can be done in four days.

When company officials were asked whether they thought this same type drainage system would work out profitably for open highways, they said it would, providing only that the job was big enough so that the volume would reduce the cost.

●

New York Lets $22,000,000 of Contracts—Contracts totalling $22,105,-045 have been awarded for New York state highway work this year up to Aug. 15. Since V-J day the total is $79,748,234, and the total mileage concerned is 825 miles.

ON THE BEAM!
with
TUTHILL
GUARD RAILS
They keep traffic off the shoulders and on the road. Convex, spring-bracket, steel panels absorb and deflect impacts, keep cars from plunging over embankments. Easy to see. They beautify the highway, too; rounded end-pieces give extra neatness.
Choose Tuthill Guard Rails. They are economical to buy, to install, and to maintain. REQUEST DETAILS
TUTHILL SPRING CO.
761 W. POLK STREET, CHICAGO 7, ILLINOIS

Fasten It FASTER and BETTER
with
TEMPOTOOL
THE NEW TIME-SAVING, MONEY-SAVING METHOD FOR ATTACHING STEEL TO STEEL—STEEL TO CONCRETE OR BRICK
NOW AVAILABLE IN THE NEW STREAMLINED MODELS WITH AUTOMATIC TWIN SAFETY FEATURE!
SOLD NATIONALLY THROUGH RECOGNIZED DISTRIBUTORS ONLY
NO DRILLING
COMPLETELY SAFE
EASY TO USE
THOROUGHLY TESTED
NO WIRES OR AIR LINES
TEMPOTOOL - MODEL 2B
TEMPOTOOL - MODEL 22
With Safety Shield
PATENTS PENDING
TEMPO PRODUCTS COMPANY
1900 EUCLID AVE. Rm.300 CLEVELAND 15, OHIO
PRINCIPLE OF OPERATION
TEMPOTOOL employs the power of an exploding cartridge to drive "holding studs" into steel or concrete. The tool is fired by pushing the muzzle of the tool sharply against the work.
TEMPOTOOL projectiles have a thin flange around the edge of the head which shears off when the tool is fired. This flange, by momentarily cushioning the gases of the explosion, builds up the necessary pressure which gives the projectiles their high velocity. Despite this power, recoil is amazingly light.
TYPICAL PROJECTILES
DRIVE PIN
THREADED STUD
INTERNAL THREADED STUD
Other type studs made to order for special jobs.
TEMPOTOOL
THE NEW Powder-Actuated HAND TOOL

WITH THE MANUFACTURERS & DISTRIBUTORS

NIAA Honors LeTourneau

R. G. LeTourneau, Inc., Peoria, Ill., has been awarded a certificate of merit for outstanding achievement in the industrial advertising field by the National Industrial Advertisers Association. The award was presented at NIAA's recent Silver Anniversary Conference in Milwaukee, Wis. Entries in NIAA competition were divided into four classes. LeTourneau received its award in the Class A Division—Industrial Product Campaigns in Trade and Business Papers. Others receiving similar recognition in this division included General Electric, Pittsburgh Plate Glass, Shell Chemical Corporation, Allis-Chalmers and American Steel and Wire Company. This latest award is the second this year accorded the LeTourneau Corporation. A few weeks ago LeTourneau was awarded a first place silver plaque by the Associated Business Papers for advertising excellence. LeTourneau ad campaigns have been produced under the direction of LeTourneau's Customer Relations Division Manager, E. E. Weyeneth, Assistant Manager J. G. Van de Loo and their staff, and the Andrews Agency of Milwaukee.

Reviewing LeTourneau's latest award are, left to right, J. G. Van de Loo; Arnold Andrews, Andrews Agency, and E. E. Weyeneth.

Chicago Pneumatic Opens New Office

The Chicago Pneumatic Tool Co. of New York has opened a new branch office at 528 11th St., Rock Island, Ill. It will be under jurisdiction of Chicago District Office, of which G. C. Vanden-Boom is district manager. J. C. Wisner and A. B. Rudstrom will handle sales and service in the Rock Island office.

Mathews Promoted by "Caterpillar"

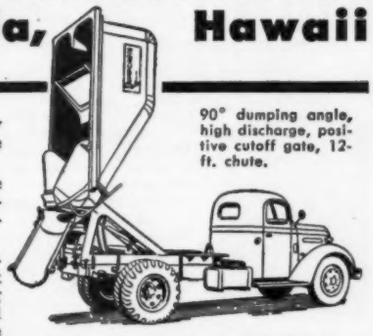
Kirby Mathews

Kirby Mathews has been appointed district representative by Caterpillar Tractor Co., Peoria, Ill., to serve dealers in Montana and Alberta, Canada. He succeeds Kenneth F. Ames, who has been assigned to special duties in the company's general sales department. Mr. Mathews has been a member of the "Caterpillar" organization since 1935. He became a service representative in 1944, covering the same territory for which he has now been named a district representative.

Personnel Expansion by Keystone

Expanded output of asphalt mastic board products for building and paving construction has brought a promotion and three new appointments at Keystone Asphalt Products Co., a division of American-Marietta Co., Jas. E. Poole, 5-year veteran in highway specialty sales at Keystone, has been promoted to the position of sales

Today the DUMPCRETE is hauling concrete in 34 states, Canada, Hawaii



90° dumping angle, high discharge, positive cutoff gate, 12-ft. chute.

Concrete men all over the country have found out that the Dumpcrete hauls good concrete at low cost.

They have learned how to produce better concrete cheaper with a central mixing plant, air-entrained concrete, and the Dumpcrete.

This low-cost way to produce top-quality concrete is used with great success by ready-mix and building supply companies, by highway and industrial contractors, by house builders and heavy construction concerns, and by local, state and national government agencies.

They are hauling concrete over 45 minutes without agitation and without segregation. They are dumping into buckets, hoppers and forms without a ramp. They are placing low-slump, easy-to-work concrete right where it's wanted with a long 12-foot chute.

They are using the Dumpcrete as a utility body, too . . . to haul sand, gravel, mortar, coal and earth.

Their costs are low. Their production is high. No wonder they like the Dumpcrete.

You will want to learn more about the Dumpcrete. Send the coupon today. Early delivery.

DUMPCRETE

Division, MAXON CONSTRUCTION COMPANY, INC.

420 Talbott Building, Dayton 2, Ohio

Please send Dumpcrete information.

Firm_____ Name_____

Street_____

City_____ State_____

CONTRACTORS
RUBBER PRODUCTS
available from Stock
for immediate Delivery

CONVEYOR, ELEVATOR and
TRANSMISSION BELTING
all widths and plies
V-BELTS all sizes

HOSE
all sizes and types

AIR	DISCHARGE	STEAM
FUEL	COMPRESSOR	VACUUM
FIRE	PILE DRIVERS	SUCTION
WATER	ROAD BUILDERS	WELDING

BOOTS, DREDGE SLEEVES,
PUMP DIAPHRAGMS, ETC.

. . . and everything rubber
for Industrial Requirements

Write for new catalog
PHONE . . . . . WRITE . . . . . WIRE

CARLYLE RUBBER CO., Inc.
62-66 PARK PLACE NEW YORK 7, N. Y.
Phone BArclay 7-9793

Shunk Snow Plow and Ice Removal BLADES

Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.

FOR ALL TYPES AND MODELS OF SNOW PLOWS
Various widths, lengths, thicknesses--flat or curved--standard or special--punched ready to fit your machine.

SHUNK SAW-TOOTH ICE BLADE
Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.

Shunk
MANUFACTURING COMPANY
ESTABLISHED 1854
BUCYRUS, OHIO

manager in the company's Paving Products Division. He continues as a close assistant to T. R. Johnson, general manager, in all the company's sales operations. Bryant W. Pocock, long prominent as a chemist and author in metallurgical and products finishing fields, has been named to the new post of research director.

B. W. Pocock

J. E. Poole

He will direct all research and development on new asphalt products and applications for industry, building and paving construction. He formerly was a research chemist with the Michigan State Highway Department. Keystone rounded out its current personnel expansion with appointment of two new service specialists. William C. Allen of Dallas and Merle L. Cripe of Chicago will serve airport, highway, and building material users throughout the East, Midwest and Southwest.

E. M. Platts Promoted

E. M. Platts

E. M. Platts has been appointed vice president in charge of sales of Joy Manufacturing Co., Pittsburgh, Pa. This appointment marks the latest upward step in Mr. Platts' 30-year career in the mining industry. Among other past activities, he was one of the principal incorporators of the La-Del Conveyor and Manufacturing Co. He headed up the sales force of that company since its inception, and when La-Del became a division of Joy Manufacturing Co., Mr. Platts moved over to Joy as vice president in charge of coal mining sales. In his new position, sales of all Joy Manufacturing Co. products will come directly under Mr. Platts' supervision.

ESCO Opens Illinois Plant

Electric Steel Foundry, Portland, Ore., has established a plant at Danville, Ill., which is now producing its ESCO line of dragline buckets and dippers. The new plant is under supervision of Vincent J. Shanahan, formerly with Portland foundry.

A. A. S. H. O.
STANDARD SPECIFICATIONS
FOR HIGHWAY MATERIALS
AND
METHODS OF SAMPLING
AND TESTING

New and Revised
FIFTH EDITION

Now Available
2 Volumes, 6" x 9" cloth-bound
(Volumes Not Sold Separately)
Price $6.00 postpaid
(Foreign Postage Extra)

State Engineer
County Engineer
City Engineer
Consulting Engineer
Highway Contractor
Material Manufacturer
Library

You need these official
A.A.S.H.O. Specifications
in your reference file.

To insure prompt delivery order direct from

American Association of State Highway Officials
1220 National Press Bldg.
Washington 4, D. C.

No. 0 EMBURY
AIR PILOT
LANTERN
Order through Your Jobber
EMBURY MFG. CO., WARSAW, N. Y.

G. L. Lillard Is Dead

G. L. Lillard, southern district manager of the Shovel and Crane Division of the Lima Locomotive Works, Inc., died August 20 from injuries resulting from an automobile accident on August 7 near Pine Bluff, Ark. "G.L.," as he was known to many of his friends, joined the Lima organization in 1931 as manager of the Southern District with offices at 79 McCall St., Memphis, Tenn., a position he held until the time of his death.

Galion Promotes Monnett and Finney

R. C. Monnett

Robert C. Monnett, heretofore North Central District representative, has been appointed sales manager of the Eastern and Central Districts of The Galion Iron Works & Mfg. Co., Galion, O. After being graduated with B.S. degree in civil engineering he worked as field engineer for Ford Motor Co. for several years. He then became connected with the Ohio Department of Highways, serving in various engineering capacities, holding the position of division engineer at the time he joined The Galion Iron Works & Mfg. Co. in 1945.

G. D. Finney

G. D. Finney has been promoted from assistant sales manager to sales manager of the Western and Southern Division. Mr. Finney entered the employ of the Galion Iron Works & Manufacturing Co. in 1916, working in the Accounting Department and later in the Sales Department. He was in the Army during World War I, and after being discharged from the service was appointed assistant branch manager at Kansas City. After a year in Kansas City, he returned to the home office and was connected with the Sales Department for a number of years. After an absence of several years, he returned to Galion in 1939 as assistant sales manager, which position he held until his recent promotion.

Appointed District Representative

R. J. Loskill

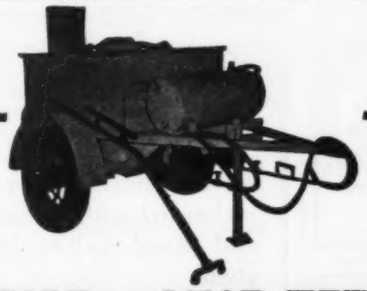
R. J. Loskill, former central division credit manager of Caterpillar Tractor Co., Peoria, Ill., has been appointed a central sales division district representative. He will serve the following "Caterpillar" distributors: Gibbs-Cook Tractor & Equipment Co. of Iowa; Halladay-Dettman Co. of South Dakota; Lincoln Equipment Company of Nebraska and Missouri Valley Machinery Co. of Nebraska. He joined "Caterpillar's" manufacturing department in 1936. In 1944 he became affiliated with the Treasury Department, first as western division credit manager and later as central division credit manager, before joining the central sales division. He replaces T. R. Clark, who has resigned as district representative to become sales manager for Held & McCoy Machinery Co., Denver, Colo.

Extensions Considered for Kentucky Contractors

Due to the abnormally wet weather this year many Kentucky road contractors have faced payment of damages for failure to complete work on schedule. At a special late-summer meeting called at Frankfort to discuss this situation, contractors were assured that the state stood ready to cooperate with reasonable time extensions, according to J. Steven Watkins, commissioner of highways. A highway department committee is to take under advisement the conditions affecting work.

From April 1 to August 1 rain fell on 32 days in Lexington and on 54 days in the Louisville area.

W. O. Snyder, secretary, Kentucky Association of Highway Contractors, and Marion Ross, secretary of the Plant-Mix Association, headed the group of contractors and material people attending the conference.



ASPHALT and TAR KETTLES

FIRE PROOF—OIL BURNING
Hand and Motor Driven spray.
Many sizes. Write for catalog.

Elkhart White Mfg. Co. Indiana

ETNYRE

"Black-Topper"

BITUMINOUS DISTRIBUTORS

ACCURATE...DEPENDABLE...ECONOMICAL

Reduce labor costs, save time, minimize maintenance with an Etnyre "Black-Topper". Covers roads up to 24 feet wide in one trip...low-cost operation...accurate and dependable. See your Etnyre dealer or write us today for complete details.

E. D. ETNYRE & CO., Oregon, Illinois

60 Years in Petroleum Industry

The Ohio Oil Co., Findlay, O., on Aug. 1 celebrated the 60th anniversary of its founding. As a part of its anniversary program, the company has issued a book giving a history of its 60 years of continuous operation in the petroleum industry. The 48 page book, containing text and pictures, charts, and other illustrations, was prepared by members of the company's staff. The book entitled "Sixty Years of Progress" devotes substantial space to the origin and the background leading to the formation of The Ohio Oil Company on Aug. 1, 1887. It traces the growth of the company since its inception as a local oil producing enterprise in the Trenton Limestone field in northwestern Ohio to its present position as a nationwide oil company playing an important part in all phases of the petroleum industry—production, transportation, refining and marketing. Short accounts of the major economic and technical factors which have influenced not only the company but the petroleum industry and the Nation are woven into the history. Although the book is essentially general in character, enough detail is included to permit an intelligent understanding of the various changes in corporate structure which the company has undergone during its evolution. The principal personalities concerned are brought into the story but emphasis is placed more on the events in which they participated rather than on their character or individual accomplishments.

McK. White Is Rotary Official

W. McK. White, President of White Manufacturing Co., Elkhart, Ind., manufacturers of road building and maintenance machinery, was elected a District Governor of Rotary International, world-wide service organization, at the Rotary Convention held last month in San Francisco. He was chosen to serve as Governor of the 154th Rotary District for the fiscal year 1947-48.

New Davey Distributor

Fly & Harwood, Inc., 300 Madison Ave., Memphis, Tenn., have been appointed distributors of the compressor line of Davey Compressor Co., Kent, O.

CLEARING HOUSE

FOR SALE
REBUILT

(or may be purchased as is)

Alemite:
4 pump Grease Plant

Compressors:
Portable 105' I.R.G.D. and C.P.
Portable 160' Chicago Pneumatic
Portable 210' Davey
Portable 315' C.P. and Davey
Portable 365' Gardner Denver

Cranes—Wheeled Tractor:
2 and 4 ton on Minneapolis Moline pneumatic tired tractors

Light Plants:
14 Kohler, Onon and Peerless

Pumps—Centrifugal:
16 Rex and Novo—all sizes

Pumpcrete:
2 Rex 160

Truck Mixers:
3 and 4½ yard

INDUSTRIAL EQUIPMENT COMPANY
10911 RUSSELL ST.
OAKLAND CALIF.

SURPLUS CONTRACTORS EQUIPMENT
1 Allis-Chalmers Superior McCully 10 in Gyratory Crusher No. 7971, —1,350.
1 Worthington Superior Mc-Cully 8 in. Gyrator Crusher No. 1134, $1,150.
1 Speeder-B2 ⅝ yd. capacity shovel, $5,500.
All quoted prices F.O.B. Milwaukee, Wis., subject to prior sale.
Phone or write for appointment.
F. W. CHELLIG
1737 N. 30th St., Milwaukee 8, Wis.
Kilbourn 1545 or 2780

FOR SALE
5—Osgood Model 200-½ Yard Capacity. Combination Backhoes, Draglines and Cranes. All new models.
2—TD 18 International Bulldozers with 12 Fot. Angledozer. Rebuilt.
1—B-4 Caterpillar Tractor used 500 hours.
1—Cletrac Bulldozer—Model CG-Rebuilt.
1—Sargent Overhead Loader on Cletrac Tractor—Good as new.
1—Allis-Chalmers Front End Loader on Rubber Tires.
1—Barber-Greene Trencher 5½ Foot—Rebuilt.
5—160 Davey Compressors Mounted on Trucks—New 1947.
2—105 Davey Compressors mounted on Trucks—New 1947.
3—160 Worthington Compressors mounted on Trucks—New 1947.
1—McKiernan-Terry Air Hammer No. 2—New.
1—Littleford Roller for Driveways.
1—Westinghouse 300 Amp. Stationary Welder.
Buckets—Clamshells, Draglines ⅜ Yard & ½ Yard.
Pick-up Trucks and Dump Trucks.
All machinery—immediate shipment
Write to J. A. Laporte
Wilson Boulevard at Barton Street
Arlington, Virginia

WANTED IMMEDIATELY
CATERPILLAR D7 TRACTOR—9G MODELS
CATERPILLAR D4 TRACTORS—with or without TRACKSON HI-LIFT
Box 110—Roads & Streets
22 W. Maple Street, Chicago 10, Ill.

WANTED
Sales manager to represent manufacturer of road-building equipment. Must know the application of road oils, cut-back asphalts, emulsions and soil cement on base stabilization and roadmix jobs by modern methods. Sales experience required. Must be willing to travel. Good salary and good future for the right man. Give complete details in letter to Box 620, North Hollywood, California.

FOR SALE
1 6500 GPM Chicago Pump, complete including 60 HP motor 690 RPM 60 cycle AC three phase dynamic head, 23 feet.
Miscellaneous fittings — 14 inches dia with 14 inch check and stand valves including stand.
Materials can be viewed at New Kensington, Pa.
L. H. Heinle, City Clerk, City Hall, New Kensington, Pa.

PORTABLE
ASPHALT PLANTS
High Production—Low Cost

THE McCARTER IRON WORKS, INC.
NORRISTOWN, PENNA.

RELIANCE
CRUSHING, SCREENING and WASHING UNITS
● Up to 2000 Tons a Day ●

Crushers
Elevators
Sweepers
Screens
Wash Boxes
Bins
Pulverizers
Feeders
Spreaders
Kettles
Conveyors
Drag-Lines
"GAYCO"
Centrifugal
Air Separators

UNIVERSAL ROAD MACHINERY CO.
Kingston, N. Y.
Canadian Representatives: F. H. Hopkins & Co., Ltd.
340 Canada Cement Co., Montreal, Que., Can.

QUITTING BUSINESS?

Are you planning on selling your construction outfit? The certain method to reach all buyers and obtain the top prices for your equipment and real estate is to sell it at auction. Exclusively auctioneers since 1921, experience in selling construction equipment and real estate, write or call for sale in any part of United States.

FORKE BROS. & FICKE
The Auctioneers
TEL. 2-1452
314 SHARP BLDG. • LINCOLN, NEBR.

New ATECO Distributor

American Tractor Equipment Corporation, Oakland, Calif., has appointed Howard-Cooper Corporation as distributor in Oregon and western Washington for its 2-wheel and 4-wheel scrapers for use with wheel and track type tractors. Sales and service will be available through Howard-Cooper Corporation's headquarters in Portland and its branches at Seattle, Albany, Eugene, Roseburg, Central Point and Klamath Falls.

Morris Named Sales Manager

R. E. Morris

R. E. Morris has been named sales manager of the Pickup Dump Division, National Truck Equipment Co., Waukesha, Wis. He had been sales manager of the Baughman Manufacturing Co., spreader manufacturers at Jerseyville, Ill. In his new position he will direct the national sales and distribution of National Truck's new pickup dump unit.

Hill Appointed Field Sales Engineer

R. A. Hill

V. C. Genn, general sales manager of the Detroit Diesel Engine Division, General Motors Corporation, has announced the appointment of Royce A. Hill as field sales engineer for the northern section of the Division's Dallas region. Mr. Hill will be responsible for all industrial and petroleum distributor's sales activities for the territory which includes Oklahoma, northern Texas and northern New Mexico. He will also cover the upper part of Louisiana for petroleum sales distributors only. He succeeds Fred L. Manton, who has taken the position of sales manager with the Diesel Power Co., distributors for General Motors Series 71 engines in Oklahoma.

Clark Joins Rosco

H. C. Clark

Harold C. Clark, head of the Road Machinery Division of Cleaver-Brooks Co., Milwaukee, Wis., joined the Rosco Mfg. Co., Minneapolis, Minn., on July 15th. He will assist Thorman and Reuben Rosholt of Rosco Mfg. Co. and in this capacity will have complete charge of all sales east of the Mississippi River. Mr. Clark was associated with the Cleaver-Brooks Co. for twelve years; ten years as head of the Road Machinery Division.

●

Colorado Gas Tax Payments Double—Colorado motorists have almost doubled their gas tax payments under the 2-cent tax hike in that state. With the gas tax now standing at 6c a gallon, Colorado collected $1,985,653 in motor fuel taxes in June compared with $1,198,689 the previous June.

VULCAN PAVEMENT AND CLAY DIGGING TOOLS

ARE MADE in a complete line of sizes to fit all standard compressed air hammers.

Send for NEW Vulcan illustrated CATALOG today.

VULCAN TOOLS — THE WORLD OVER — NOTED FOR QUALITY AND DURABILITY

VULCAN TOOL MFG. CO.
QUINCY, MASS.

TRANSITS and LEVELS
HEADQUARTERS for REPAIRS — any make

We will buy or trade in old Transits Levels, Alidades, etc. Send instruments for valuation.

Write for new Catalogue RS-109 of Engineering Instruments, Engineering Field Equipment and Drafting Room Supplies.

WARREN-KNIGHT CO.
Mfgrs. of Sterling Transits & Levels
136 N. 12th St. • Philadelphia, Pa.

ARIENS AGGMIXER
FOR SECONDARY ROAD CONSTRUCTION

The swirling, chopping action of these tines does a thorough job of mixing, wet or dry.

Here's equipment designed especially for mixed-in-place construction — to operate in connection with other general purpose equipment. Wherever aggregates are used it thoroughly pulverizes, mixes and aerates aggregates with binder—rapidly and economically. Also ideal for soil cement stabilization. Safe and easy to operate . . . adjustable to any tractor . . . made 4 standard sizes, 4', 5', 6' and 7'. Write for details.

ARIENS COMPANY
BRILLION, WIS.

Inquiry Blank and Advertisers' Index

Check reference to advertisement or to items of equipment or materials on which you wish to receive information. Give your name and address in the space at foot of page (if convenient, please print or use typewriter), detach page and mail to ROADS AND STREETS, Readers' Service Department, 22 West Maple Street, Chicago 10, Ill. We will pass your inquiry along to manufacturers and see that you get desired information promptly.

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Check other products below on which you wish us to obtain information for you:

AGGREGATE:
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- ☐ Conveyors
- ☐ Crushers
- ☐ Portable Plants
- ☐ Screens

BITUMINOUS:
- ☐ Batchers
- ☐ Finishers
- ☐ Distributors
- ☐ Dryers
- ☐ Heaters
- ☐ Plants (central)
- ☐ Plants (travel)

CONCRETE:
- ☐ Batchers
- ☐ Buggies and Carts
- ☐ Finishers
- ☐ Joints, Expansion and Contraction
- ☐ Reinforcement Accessories
- ☐ Metal Road Accessories
- ☐ Mixers (under 1 yd.)
- ☐ Mixers (1 yd. up)
- ☐ Pavers
- ☐ Reinforcing Steel
- ☐ Road Forms (1000' set)
- ☐ Tower
- ☐ Truck Mixers

CRANES:
- ☐ Crawler Mounted
- ☐ Truck Mounted
- ☐ Piledrivers

GRADERS:
- ☐ Blade, self propelled
- ☐ Blade, pull type
- ☐ Blade, under truck
- ☐ Elevating

LOADERS & TRENCHERS:
- ☐ Front-end loader (tractor mounted)
- ☐ Loader, bucket type and belt type
- ☐ Trencher or Ditcher

HAULING EQUIPMENT:
- ☐ Dump Trucks, self-powered
- ☐ Dump Wagons, tractor drawn
- ☐ Flatbed Trailers
- ☐ Other Trucks

PUMPS:
- ☐ Centrifugal
- ☐ Concrete
- ☐ Diaphragm
- ☐ Mud Jacking
- ☐ Piston
- ☐ Wellpoint

POWER UNIT: (Independent)
- ☐ Gasoline
- ☐ Diesel
- ☐ Electric

ROLLERS:
- ☐ Power (Smooth)
- ☐ Pneumatic Tire
- ☐ Sheepsfoot

TRACTORS:
- ☐ Crawler
- ☐ Rubber-Tired

TRACTOR EQUIPMENT:
- ☐ Dozers
- ☐ Power Control Units
- ☐ Rippers
- ☐ Scrapers, tractor drawn
- ☐ Scrapers, self-powered

BUCKETS:
- ☐ Clamshell
- ☐ Concrete
- ☐ Dragline
- ☐ Orange Peel

SHOVELS & DRAGLINES:
- ☐ Crawler (under 1 yd.)
- ☐ Crawler (1 yd. up)
- ☐ Truck Mounted

ROCK DRILLS & AIR TOOLS:
- ☐ Air Compressors
- ☐ Backfill Tampers
- ☐ Clay Diggers
- ☐ Concrete Vibrators
- ☐ Drills, cabel tool
- ☐ Drills, tripod and wagon
- ☐ Drills, rock, hand-held
- ☐ Paint Sprayers
- ☐ Paving Breakers
- ☐ Riveters and Chippers

MISCELLANEOUS:
- ☐ Buildings, portable
- ☐ Earth Drills, power
- ☐ Light Plants
- ☐ Lubrication, Service Truck
- ☐ Mowers, Highway
- ☐ Power Saws
- ☐ Soil Stabilizing Equipment
- ☐ Snowplows, rotary
- ☐ Snowplows, v or wing
- ☐ Spreaders, sand or cinders
- ☐ Street Flushers
- ☐ Street Sweepers
- ☐ Welders
- ☐ Cutting Torches
- ☐ Hydraulic Jacks
- ☐ Hydraulic Control Equipment
- ☐ Hand Tools
- ☐ Hoists, derrick type

Be sure to fill in name and address below:

Your Name.....Title or profession.....

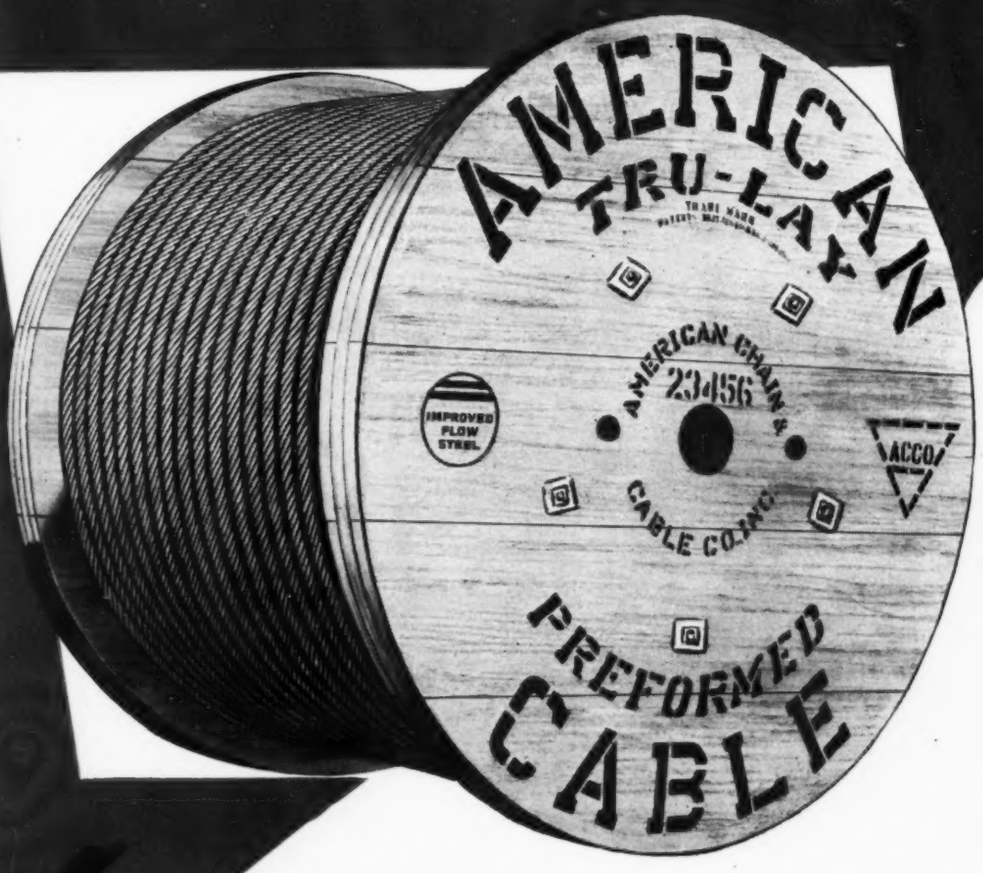
Name of your company or governmental department.....

Type of work for which equipment will be used.....

Street Address.....

City ..... State ..... County .....

TRU-LAY *Preformed*



for CLAMSHELL CLOSING LINES

Operators are proud of what they can do with a clamshell bucket. They like TRU-LAY wire rope for their closing lines because it helps them do a better job. • You might call it "gilt-edge" wire rope . . . this TRU-LAY. It cuts clean without seizing. It takes the reverse bends and will run longer over small sheaves. When wires do break, they don't turn into barbs that will slice a fellow's hand right through his glove. These are the advantages gained by Preforming TRU-LAY. • Add to this the strength provided by the toughest of Improved Plow Steel wires and you get a rope that will stand the gaff. Ask for TRU-LAY Preformed Improved Plow Steel.

AMERICAN CABLE DIVISION
AMERICAN CHAIN & CABLE

A 750,000 square yard paving program in Worcester, Mass.

The scope of Worcester's 1947 paving program reflects its position as New England's third largest city. Approximately 750,000 square yards of the city's worn streets are being resurfaced with resilient, heavy-duty Asphaltic Concrete paving. All streets with car tracks are being resurfaced this year. Included in the program are the city's three principal thoroughfares.

The Texaco Asphaltic Concrete pavement employed on Worcester's streets is laid in two courses, having a total compacted thickness of three inches. Based on past experience with this type of construction, the city's officials anticipate 20 years of wholly satisfactory service from their new pavement.

In paving with Texaco, Worcester keeps good company. Three out of four of America's largest cities (population 25,000 and over) have constructed substantial yardages of Texaco Asphalt paving during the past 40 years.

For help with a street paving or maintenance problem, call on a Texaco Engineer who is an Asphalt specialist. Write our nearest office.

ASPHALT SIDEWALKS

In addition to providing a durable, economical pavement for streets, Texaco Asphaltic Concrete also is an ideal surface for sidewalks. Worcester is spending $100,000 this year in the construction of sidewalks of this type.

TEXACO
REG. T. M.

THE TEXAS COMPANY, Asphalt Sales Dept., 135 E. 42nd Street, New York City 17

Boston 16 Chicago 4 Denver 1 Houston 1 Jacksonville 2 Philadelphia 2 Richmond 19

TEXACO ASPHALT